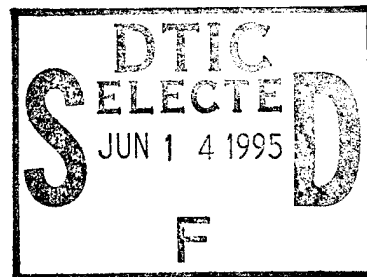


GUIDE SPECIFICATIONS
NORTHWEST BOUNDARY CONTAINMENT/
TREATMENT SYSTEM

ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

FY-82 MCA LINE ITEM 37
DACA 45-82-C-0065

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SPECIFICATIONS FOR THE NORTHWEST BOUNDARY SYSTEM INCLUDE THESE ELEMENTS:

1. SEWERS AND PLUMBING
2. MASONRY AND CARPENTRY
3. BUILDING MATERIALS, SUCH AS STEEL, CAULKINGS, HARDWARE, GLASS
4. PAINTING
5. CARBON ADSORPTION TREATMENT SYSTEM - PUMPS, FILTERS, PIPES.

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GUIDE SPECIFICATIONS
NORTHWEST BOUNDARY CONTAINMENT/TREATMENT SYSTEM

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Edited versions of the following Specifications were submitted on January 14, 1983 to MROED-M:

Section 2A	Excavation, Filling and Backfilling for Building.
Section 2B	Excavation, Trenching and Backfilling for Utility Systems.
Section 3A	Concrete for Building Construction.

Edited versions of the following Specifications were submitted on January 20, 1983 to MROED-M:

Section 16A	Electrical Work, Interior.
Section 16B	Lightning Protection System.

The following Specification Sections are contained herein:

Section 2C	Sewers, Sanitary, Gravity.
Section 2D	Gas Distribution System.
Section 4A	Masonry.
Section 5A	Structural Steel.
Section 5B	Miscellaneous Steel.
Section 6A	Rough Carpentry.
Section 7A	Caulkings and Sealants.
Section 7B	Ventilators; Roof; Gravity-Type.
Section 8A	Steel Doors and Frames.
Section 8B	Hardware; Builders' (General Purpose).
Section 8C	Glass and Glazing.
Section 9A	Painting (General).

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ZERO ACCIDENTS
SECTION 2C
SEWERS; SANITARY, GRAVITY

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| 1. Applicable Publications | 5. Concrete Cradle &
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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS

A 74-81	Cast Iron Soil Pipe & Fittings
C 14-81	Concrete Sewer, Storm Drain, and Culvert Pipe
C 33-82	Concrete Aggregates
C 150-81	Portland Cement
C 260-77	Air-Entraining Admixtures for Concrete
C 425-77	Compression Joints for Vitrified Clay Pipe and Fittings
C 443-79	Joints for Circular Concrete Sewer and Culvert Pipe, Using rubber Gaskets
C 644-80	Asbestos-Cement Nonpressure Small Diameter sewer Pipe
C 700-78a	Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
D 1869-78	Rubber Rings for Asbestos-Cement Pipe
D 2412-77	External Loading Properties of Plastic Pipe by Parallel-Plate Loading
D 2751-80	Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
D 3034-81	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D 3212-81	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
D 3262-81	Reinforced Plastic Mortar Sewer Pipe
D 3840-81	Reinforced Plastic Mortar Pipe Fittings for Non-Pressure Applications
F 402-80	Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings

1.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS

No. 49-1975	Hazardous Chemicals Data
No. 325M-1977	Flammable Liquids, Gases and Volatile Solids
No. 704-1980	Identification of the Fire Hazards of Materials

2. GENERAL. Gravity sanitary sewers shall be constructed in conformance with this section of the specifications. The construction required herein shall include appurtenant structures and building sewers to points of connection with the building drains 5 feet outside the buildings to which the sewer system is to be connected. Reducing fittings shall be provided as necessary to accommodate different pipe sizes. Excavation and backfilling shall conform to SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Backfilling shall be accomplished only after inspection and approval of the Contracting Officer. Work covered by this section will not be accepted until backfilling connected with the work has been completed satisfactorily.

3. MATERIALS shall conform to the respective specifications and other requirements specified below:

3.1 PIPE may be of any of the following materials unless otherwise specified or shown.

3.1.1 Asbestos-Cement Pipe and Fittings

3.1.1.1 Asbestos-Cement Pipe, 6 Inches or Smaller in Diameter. ASTM C 644, Type II.

3.1.1.2 Joints. Rubber rings for asbestos-cement pipe joints shall conform to ASTM D 1869.

3.1.1.3 Fittings and Specials for use with asbestos-cement pipe shall have a strength not less than the pipe and shall be either asbestos-cement or cast iron, bell end, conforming to

ASTM A 74 except that profile of bell may have special dimensions as required by the pipe manufacturer.

3.1.2 Clay Pipe and Fittings

3.1.2.1 Standard Strength Clay Pipe and Fittings.

ASTM C 700.

3.1.2.2 Compression Joints. ASTM C 425.

3.1.3 Concrete Pipe. Pipe 24 inches or less in diameter, unless otherwise shown or specified, shall be nonreinforced.

3.1.3.1 Nonreinforced Concrete Pipe and Specials.
ASTM C 14, Class 1 unless otherwise shown or specified to be Class 2. Portland cement shall be as specified herein.

3.1.3.2 Joints. Joint and gasket materials shall conform to ASTM C 443.

- a. Pipe less than 36 inches in diameter shall be bell and spigot type.

3.1.3.3 Portland cement for Manufacture of Concrete Pipe and Fittings. Cement shall conform to ASTM C 150, Type V. The Contractor shall furnish manufacturer's certificate stating the type of cement used in manufacture of the pipe furnished. Air-entraining admixture conforming to ASTM C 260 shall be used with Type V cement. Where aggregates are alkali reactive, as determined in accordance with Appendix XI of ASTM C 33, a cement containing less than 0.60 percent alkalis shall be used.

3.1.4 Plastic Pipe. Plastic pipe shall not be used for sewers larger than 15 inches in diameter.

3.1.4.1 Acrylonitrile-butadiene-styrene (ABS) Pipe and Fittings. ASTM D 2751, solvent weld or bell and socket o-ring joint, size 12-inch or less in diameter.

3.1.4.2 Poly (Vinyl Chloride) (PVC) Pipe and Fittings. ASTM D 3034, Type PSM with a maximum SDR of 35, size 15-inch or less in diameter, with flexible elastomeric seal joint.

3.1.4.3 Joints

3.1.4.3.1 Acrylonitrile-butadiene-styrene (ABS) Pipe. solvent cement or elastomeric joint in accordance with ASTM D 2751, dimensions and tolerances in accordance with Table 2 therein.

3.1.4.3.2 Poly (Vinyl Chloride) (PVC) Pipe.
Elastomeric gasket joint in accordance with the requirements of ASTM D 3212.

3.1.4.4 Branch Connections. Branch connections shall be made by use of regular fittings or solvent cemented saddles as approved by the Contracting Officer. Saddles for acrylonitrile-butadiene-styrene (ABS) pipe shall comply with Table 3 of ASTM D 2751, and saddles for poly (vinyl chloride) (PVC) pipe shall comply with Table 4 of ASTM D 3034.

3.1.4.5 Reinforced Plastic Mortar Pipe. ASTM D 3262

3.1.4.5.1 Fittings shall be in accordance with ASTM D 3840 compatible with the pipe supplied and shall have a strength not less than the pipe.

3.1.4.5.2 Joints. Elastomeric gasket joints shall comply with manufacturer's instructions.

3.1.4.6 Protection of Material. Before, during, and after installation, plastic pipe and fittings shall be protected from exposure to sunlight and any environment that would result in damage or deterioration to the material. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use will be discarded when the recommended pot life is exceeded.

3.2 CEMENT MORTAR. ASTM C 270, Type M. Use Type IIA cement.

3.3 PORTLAND CEMENT. Cement used in concrete cradle and encasement may be of optional type.

3.4 PORTLAND CEMENT CONCRETE. ASTM C 94, compressive strength of 4,000 p.s.i. at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

4. INSTALLATION

4.1 ADJACENT FACILITIES

4.1.1 Waterlines. Where the location of the sewer is not clearly defined by dimensions on the drawings, the sewer shall not be closer horizontally than 10 feet to a water-supply main or service line, except that where the bottom of the water pipe will be at least 12 inches above the top of the sewer pipe, the horizontal spacing may be a minimum of 6 feet. Where gravity-flow sewers cross above waterlines, the sewer pipe for a distance of 10 feet on each side of the crossing shall be fully encased in concrete or shall be acceptable pressure pipe with no joint closer horizontally than 3 feet to the crossing. The thickness of the concrete encasement including that at the pipe joints shall be not less than 4 inches.

4.2 PIPE LAYING

- a. Pipe shall be protected during handling against impact shocks and free fall and the pipe interior shall be free of extraneous material.
- b. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow. Each pipe shall be laid accurately to the line and grade shown on the drawings. Pipe shall be laid and centered so that the sewer has a uniform invert. As the work progresses, the interior of the sewer shall be cleared of all superfluous materials.
- c. Before making pipe joints all surfaces of the portions of the pipe to be joined shall be clean and dry. Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. The joints shall then be placed, fitted, joined, and adjusted so as to obtain the degree of water tightness required.
- d. Installations of solvent weld joint pipe, using ABS or PVC pipe and fittings shall be installed in accordance with ASTM F 402, and all required precautions shall be taken to assure adequate trench ventilation and protection for workers installing the pipe.

4.2.1 Trenches shall be kept free of water and as dry as possible during bedding, laying, and jointing and for as long a period as required. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings.

4.2.2 Backfill. As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade. Plastic pipe shall be completely covered to prevent damage from ultraviolet light.

4.2.3 Width of Trench. If the maximum width of the trench at the top of the pipe, as specified in SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, is exceeded for any reason other than by direction, the Contractor shall install at no additional cost to the Government such concrete cradling, pipe encasement, or other bedding as may be required to satisfactorily support the added load of the backfill.

4.2.4 Joints Between Different Pipe Materials shall be made as hereinbefore specified, using approved jointing materials.

4.2.5 Handling and Storage. Pipe, fittings and joint material shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities for plastic pipe,

fittings, joint materials and solvents shall be classified and marked in accordance with NFPA Standard 704, with classification as indicated in NFPA 49 and NFPA 325M.

4.3 LEAKAGE TESTS. Lines shall be tested for leakage by either infiltration tests or exfiltration tests, as appropriate. Prior to testing for leakage the trench shall be backfilled up to at least the lower half of the pipe and with sufficient additional backfill to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 0.16 gallon per inch diameter per 100 feet of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.

4.4 TEST FOR DEFLECTION. When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline on completion of all work, including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Flexible plastic pipe is defined as plastic pipe having a pipe stiffness of less than 150 p.s.i. in accordance with ASTM D 2412. Deflection shall not exceed 5 percent of the base inside pipe diameters listed in ASTM D 3034. Deflection shall be determined by use of a deflection device or by use of a GO/NO GO mandrel. Mandrel dimensions shall be determined as stated in Appendix XI of ASTM D 3034 with a machining tolerance of 0.01 inch. Failure of the mandrel to pass freely through a pipe run shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the mandrel described hereinbefore, such device shall be approved by the Contracting Officer prior to use. The device shall be sensitive to 1.0 percent of the diameter of the Pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections of 5.0 percent shall be retested by a run from the opposite direction. If the retest indicates a deflection in excess of the 5.0 percent, the suspect pipe shall be replaced. Any pipe showing deflections in excess of 5 percent at the end of one year following installation and acceptance will be replaced at no cost to the Government.

5. CONCRETE CRADLE AND ENCASEMENT. The pipe shall be supported on a concrete cradle, or encase in concrete where indicated.

6. BUILDING CONNECTIONS shall include the lines to and connection with the building waste drainage piping at a point approximately 5 feet outside the building, unless otherwise indicated. Where building drain piping is not installed, the Contractor shall terminate the building connections approximately 5 feet from the site of the building at a point and in a manner designated by the Contracting Officer.

ZERO ACCIDENTS
SECTION 2D
GAS DISTRIBUTION SYSTEM

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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.)

TT-V-51F Varnish; Asphalt

1.2 MILITARY SPECIFICATIONS (Mil. Spec.)

MIL-T-27730A Tape, Antiseize, Polytetrafluoro-
ethylene with Dispenser

1.3 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) PUBLICATIONS

B2.1-1968 Pipe Threads (Except Dryseal)

B16.3-1977 Malleable Iron Threaded Fittings, Class
150 and 300

B16.11-1980 Forged Steel Fittings, Socket-Welding
& Errata and Threaded

B16.33-1981 Manually-Operated Metallic Gas Valves,
for Use in Gas Piping Systems Up to 125
psig (Sizes 1/2 through 2)

B31.1-1980 Power Piping
& B31.1a-1980
& B31.1b-1981
& B31.1c-1981

1.4 AMERICAN PETROLEUM INSTITUTE (API) PUBLICATIONS

Spec 6D Pipeline Valves, End Closures, Connectors
and Swivels (Jan 1982)

1.5 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) PUBLICATION

Boiler and Pressure Vessel Code and Interpretation:

Section IX Welding and Brazing Qualifications
(1980: Addenda: Summer & Winter 1980;
Summer & Winter 1981; Summer 1982)

1.6 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
PUBLICATIONS:

A 53-81a Pipe, Steel, Black and Hot-Dipped,
Zinc-Coated Welded and Seamless

A 181-81 Forgings, Carbon Steel, for
General-Purpose Piping

1.7 AMERICAN WATER WORKS ASSOCIATION (AWWA) PUBLICATION

C203-78 Coal-Tar Protective Coatings and Linings
for Steel Water Pipelines - Enamel and
Tape--Hot Applied

1.8 MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND
FITTINGS INDUSTRY, INC. (MSS) PUBLICATIONS

SP-25 Standard Marking System for Valves,
Fittings, Flanges and Unions (1978)

SP-84 Steel Valves - Socket Welding and
Threaded Ends (1978)

1.9 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PUBLICATION

Std. No. 58 Storage and Handling of Liquefied
Petroleum Gases.

1.10 NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE) PUBLICATION

RP-02-74 High Voltage Electrical Inspection of
Pipeline Coating Prior to Installation

1.11 UNDERWRITERS LABORATORIES, INC. (UL) PUBLICATION

Gas and Oil Equipment Directory (September 1982 with
Quarterly Supplements)

1.13 AMERICAN WELDING SOCIETY (AWS) STANDARD

D1.1-82

Structural Welding Code - Steel

2. GENERAL REQUIREMENTS. The contract drawings indicate the extent and general arrangement of the gas distribution system. The system is intended for distribution of liquefied petroleum gas (LPG) at the specific gravity and pressure indicated and shall be suitable for this purpose. The gas distribution system shall be fabricated, installed, inspected, and tested in conformance with the applicable requirements of NFPA Std. No. 58.

2.1 WELDING. Piping shall be welded in accordance with qualified procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with Section IX, ASME Boiler and Pressure Vessel Code. Previously qualified welding procedures qualified by others, and welders and welding operators qualified by previous employers may be accepted as permitted by ANSI B31.1. The Contracting Officer shall be notified at least 24 hours in advance of tests and the tests shall be performed at the worksite if practicable. The Contracting Officer shall be furnished copies of qualified procedures and lists of names and identification symbols of qualified welders and welding operators. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with SECTION: WELDING, STRUCTURAL.

2.2 STANDARD PRODUCTS. Materials and equipment shall be the standard products of manufacturers regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

2.3 VERIFICATION OF DIMENSIONS. The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

2.4 COMPONENT MARKING. Components of the pipeline shall be marked in accordance with MSS SP-25.

2.5 HANDLING. In shipping, delivering, and installation, pipe and components shall be handled carefully to ensure a sound, undamaged condition. Particular care shall be taken not to injure pipe coating. No pipe or material of any kind shall be placed inside another pipe or fitting after the coating has been applied except as specified in paragraph INSTALLATION. Coated and wrapped steel pipe shall be handled in conformance with AWWA C203.

2.6 OPERATING AND MAINTENANCE INSTRUCTION

2.6.1 Operating instructions outlining the procedures required for system startup and operation shall be furnished. The

instructions shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and their basic operating features. Parts lists shall include recommended spare parts and maintenance supplies with current unit prices and source of supply for each item of operable equipment.

2.6.2 Maintenance instructions listing routine maintenance procedures, possible breakdowns, and repairs shall be furnished. The instructions shall include simplified diagrams for the major components as installed.

3. SUBMITTALS. In accordance with Section: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

3.1 CATEGORY I

Plug Valves

Regulators

Propane Storage Tank w/Accessories

3.2 CATEGORY II

3.2.1 For Information Only

Welding Procedures

Names and Identification Symbols for Qualified Welders

Operating and Maintenance Instructions

PART 2 - PRODUCTS

4. MATERIALS AND EQUIPMENT. Materials and equipment shall conform to the respective publications and other requirements specified:

4.1 STEEL PIPE. ASTM A 53, Grade B, type S; or API Spec. 5L seamless or electric-resistance-welded; black; wall thickness as required to meet ANSI B31.8. Furnace butt-welded pipe may be used in sizes 1-1/2 inches and smaller.

4.2 FITTINGS FOR STEEL PIPE

4.5.1 Threaded. ANSI B16.3 or B16.11, black.

4.5.2 Welded. Socket-welding fittings shall conform to ANSI B16.11.

4.5.4 Forged Branch Connections. ASTM A 181, Class 60, steel.

4.3 PIPE THREADS. ANSI B2.1.

4.4 VALVES. Valves shall conform to API Spec. 6D, Class 150, except as otherwise specified. Valves 1-1/2 inches and smaller shall have threaded end connections and shall conform to MSS SP-84 or ANSI B16.33.

4.5 PRESSURE REGULATORS. Pressure regulators for individual service shall be of iron or steel body, shall be suitable in all respects for the indicated conditions and shall be adjustable for changing the downstream pressure. The regulator shall have a capacity as indicated. The regulator shall be adjustable with automatic loading, and shall be provided with full capacity automatic pressure relief. The outlet pressure shall not vary more than 1/2 inch of water column from the setting point at the connected-load capacity for the regulator. The pressure relief shall be diaphragm-operated, spring-loaded type with vent for relief of excess pressure on the low-pressure side of each service regulator. Relief valve may be either an integral feature of the regulator or may be a separate valve. Regulators shall have a weatherproof, bugproof screened vent cap installed in the vent tapping. Separate relief vent shall have bugproof screen in valve outlet.

4.6 SEALANTS FOR STEEL PIPE THREADED JOINTS

4.6.1 Joint sealing compounds shall be listed in Underwriters Laboratories, Inc., Gas and Oil Equipment Directory, Class 20 or less.

4.6.2 Polytetrafluoroethylene tape shall conform to Mil. Spec. MIL-T-27730.

4.7 PROPANE STORAGE TANK. A liquefied petroleum storage tank of 1,000 gallon water capacity shall be provided. Tank shall be constructed and stamped per ASME Pressure Vessel Code with 250 psig working pressure. Tank shall be horizontal with saddles for mounting on concrete piers where shown on the drawings. Tank shall be complete with pressure relief valve, fill connection, liquid level indicator, pressure gage, vapor withdrawal connection, vent and gas pressure regulator. Tank shall be painted a minimum of one shop coat of white enamel.

PART 3 - EXECUTION

5. EXCAVATION AND BACKFILLING. Earthwork shall be as specified in SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

6. GAS MAINS. Pipe for gas mains shall be steel. Steel pipe and fittings shall be coated with protective covering as specified. Plastic pipe shall not be used for gas mains.

7. SERVICE LINES. Service lines shall be constructed of materials specified for gas mains and shall extend from gas main to and

including the point of delivery within 5 feet of the building. The point of delivery is the service regulator. A plug valve and a gas pressure regulator with built-in or separate relief valve shall be installed on the service line entrance outside the building, approximately 18 inches aboveground. An insulated fitting shall be installed on the inlet side of the pressure regulator and shall be capable of preventing flow of electrical current. The insulated fitting shall be of the coupling, union, or flange type. Where indicated, service line shall be provided with an underground shutoff plug valve of the same size as the service line. The service lines shall be as short and as straight as practicable between the point of delivery and the gas main and shall not be bent or curved laterally unless necessary to avoid obstructions or otherwise permitted. Service lines shall be laid with as few joints as practicable using standard lengths of pipe. Shorter lengths shall be used only for closures.

8. PROTECTIVE COVERING FOR UNDERGROUND STEEL PIPE. Except as otherwise specified, protective coverings shall be applied mechanically in a factory or field plant especially equipped for the purpose. Valves and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand, preferably at the plant that applies the covering to the pipe. Joints shall be coated and wrapped by hand. Hand coating and wrapping shall be done in a manner and with materials that will produce a covering equal in effectiveness to that of the covering applied mechanically. The coating shall be thoroughly inspected in accordance with paragraph INSPECTION OF PIPE COATINGS. The coatings shall consist of one of the following:

8.1 COAL TAR COATING AND WRAPPING. Protection shall include a coat of coal tar primer, a coat of coal tar enamel, a wrapper of coal tar saturated asbestos felt, and a wrapper of kraft paper or a coat of water-resistant whitewash, applied in the order named and conforming to the requirements of AWWA C203 in all respects as to materials, thicknesses, methods of application, tests, and handling, except that interior lining will not be required. Joints and fittings shall be coated and wrapped with materials conforming to AWWA C203.

9. INSTALLATION. Installation of the gaslines shall be in conformance with NFPA Std. No. 58. Pipe cutting shall be done without damage to the pipe. Unless otherwise authorized, cutting shall be done by an approved type of mechanical cutter. Wheel cutters shall be used where practicable.

9.1 INSTALLING PIPE UNDERGROUND. Gas service lines shall be graded as indicated. Joints in steel pipe shall be welded except as otherwise permitted for installation of valves. Mains shall have a minimum cover of 24 inches. and service lines shall have a minimum cover of 18 inches, and both mains and service lines shall be laid on firm soil for the full length. Where the trench has been excavated below pipe grade, the trench shall be backfilled with suitable material and thoroughly tamped to provide full-length bearing. Laying

the pipe on blocks to produce uniform grade will not be permitted. The pipe shall be clean inside before it is lowered into the trench and shall be kept free of water, soil, and all other foreign matter that might injure or obstruct the operation of the valves, regulators, or other equipment. When work is not in progress, open ends of pipe or fittings shall be securely closed by expandable plugs or other suitable means.

Minor changes in line or gradient of pipe that can be accomplished through natural flexibility of the pipe material without producing permanent deformation and without overstressing the joints may be made when approved. Changes in line or gradient that exceed the limitations specified shall be made with fittings specified.

9.2 INSTALLING PIPE ABOVEGROUND. Aboveground piping shall be protected against dirt and other foreign matter as specified for underground piping. Joints in steel pipe shall be welded except that joints in pipe 1-inch in diameter and smaller may be threaded; joints may also be threaded to accommodate the installation of valves.

9.3 JOINTS IN STEEL PIPE

9.3.1 Threaded Joints. Threaded joints in steel pipe shall have tapered threads evenly cut and shall be made with Underwriters' Laboratories, Inc., approved graphite compound for gas service or polytetrafluoroethylene tape applied to the male threads only. After cutting and before threading, pipe shall be reamed and burrs removed. Calking of threaded joints to stop or prevent leaks will not be permitted.

9.3.2 Welded Installation. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to NFPA Std. No. 58. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. Electrodes shall be stored and dried in accordance with AWS D1.1 or as recommended by the manufacturer. Electrodes that have been wet or have lost any of their coating shall not be used.

9.7 PRESSURE REGULATORS FOR DISTRIBUTION LINES. Pressure regulators shall be installed where shown.

10. INSPECTION OF PIPE COATINGS. Any damage to the protective covering during transit and handling shall be repaired by the Contractor before installation. Field coating and wrapping shall conform to paragraph PROTECTIVE COVERING FOR UNDERGROUND STEEL PIPE. After field coating and wrapping has been applied, the entire pipe shall be inspected by an electric holiday detector with impressed

current in accordance with NACE RP-02 using a full-ring, spring-type coil electrode. The holiday detector shall be equipped with a bell, buzzer, or other type of audible signal which sounds when a holiday is detected. All holidays in the protective covering shall be repaired immediately upon detection. Occasional checks of holiday detector potential will be made by the Contracting Officer to determine suitability of the detector.

11. TESTS. The distribution system of gas mains and service lines shall prove gas-tight by air test under a pressure of 75 psig or not less than 1-1/2 times the operating pressure, whichever is greater.

11.1 TEST OF GAS MAINS. The test shall be made on the system as a whole or on the sections that can be closed off by the valves. Smaller segments may be tested when trenches containing the segments must be backfilled before completion of other pipeline sections. The test shall continue for at least 24 hours from the time of the initial readings to the final readings of pressure and temperature. The initial test readings of the instruments shall not be made for at least 1 hour after the pipe has been subjected to the full test pressure, and neither the initial nor final readings shall be made at times of rapid changes in atmospheric conditions. The temperatures shall be representative of the actual trench conditions. There shall be no indication of reduction of pressure during the test after corrections have been made for changes in atmospheric conditions in conformity with the relationship $T(1)P(2)=T(2)P(1)$, in which T and P denote absolute temperature and pressure, respectively, and the numbers denote initial and final readings. During the test, the entire system shall be completely isolated from all compressors and other sources of air pressure. The testing instruments shall be approved and shall be subject to inspection at all times during the test.

11.2 TEST OF SERVICE LINES. Service lines shall be tested in accordance with NFPA Std. No. 58.

12. PAINTING AND FINISHING. Valves and pressure regulators exposed shall be thoroughly cleaned and given a coat of asphalt varnish conforming to Fed. Spec. TT-V-51. Piping exposed shall be coated as specified in paragraph PROTECTIVE COVERING FOR UNDERGROUND STEEL PIPE.

ZERO ACCIDENTS

SECTION 4A

MASONRY

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Attachment: Standard Detail Drawing No. 40-01-01, Sheet 4-1.

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.).

HH-I-530B Insulation Board, Thermal, Unfaced Polyurethane
& Int. Am-1 or Polyisocyanurate.

SS-C-621b Concrete Masonry Units, Hollow (and Solid, Pre-
& Int. Am-2 faced and Unglazed).

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS.

A 82-79 Cold-Drawn Steel Wire for Concrete
Reinforcement.

A 116-81 Zinc-Coated (Galvanized) Steel Woven Wire
Fence Fabric.

A 615-81a Deformed and Plain Billet-Steel Bars for
Concrete Reinforcement.

A 616-81a Rail-Steel Deformed and Plain Bars for
Concrete Reinforcement.

C 55-75 Concrete Building Brick (CDR-C 65).
(R 1980)

C 62-81 Building Brick (Solid Masonry Units Made From
Clay or Shale).

C 90-75 Hollow Load-Bearing Concrete Masonry Units.
(R 1981)

C 91-78 Masonry Cement.

- C 140-75 Sampling and Testing Concrete Masonry Units.
(R 1980)
- C 270-80a Mortar for Unit Masonry.
- C 404-76 Aggregates for Masonry Grout.
(R 1981)
- C 476-80 Grout for Reinforced and Non-Reinforced
Masonry.
- C 652-81a Hollow Brick (Hollow Masonry Units Made From
Clay or Shale).
- C 952-76 Bond Strength of Mortar to Masonry Units.

1.3 AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND
AIR-CONDITIONING ENGINEERS, INC. (ASHRAE) PUBLICATION.

ASHRAE Handbook of Fundamentals (1981).

1.4 INTERNATIONAL MASONRY INDUSTRY ALL-WEATHER COUNCIL (IMIAWC)
PUBLICATION.

Recommended Practices and Guide Specifications for Cold
Weather Masonry Contraction (Dec. 1, 1970; Sixth Printing,
July 7, 1977).

2. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS,
the Contractor shall submit data as specified herein on the following.

2.1 CATEGORY II.

2.1.1 Descriptive Data shall be submitted for approval
for joint reinforcement.

2.1.2 Samples shall be submitted for approval for
concrete masonry units, shapes, sizes and kinds in sufficient number
to show full range of color and texture.

2.1.3 Certificates of Compliance shall be submitted for
concrete masonry units, joint reinforcement, stating that the
materials conform to the specified requirements.

2.1.4 Test Reports. Certified copies of test reports,
including all test data, shall be submitted in accordance with
paragraph: **SAMPLING AND TESTING.**

3. HANDLING AND STORAGE. Materials shall be handled, stored, and
protected in an approved manner to avoid chipping, breakage, contact
with soil or contaminating material, and exposure to the elements.

Concrete masonry units shall conform to the moisture content as specified in ASTM C 90 and ASTM C 145 when delivered to the jobsite. Anchors, ties, and joint reinforcement shall be kept free of rust. Steel reinforcing bars or rods shall be free of loose scale and rust.

4. ENVIRONMENTAL REQUIREMENTS.

4.1 HOT WEATHER INSTALLATION. Masonry erected when the ambient air has a temperature of more than 99°F, in the shade, and has a relative humidity of less than 50% shall be protected from direct exposure to wind and sun for 48 hours after installation.

4.2 COLD WEATHER INSTALLATION shall be in accordance with IMIABC, Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

5. MATERIALS shall conform to the respective specifications and other requirements specified below.

5.1 CONCRETE BRICK. ASTM C 55, Type I, Grade N-1. Concrete brick may be used where necessary for filling out in concrete-masonry unit construction.

5.2 CONCRETE MASONRY UNITS. ASTM C 90, Type I, Grade N-1 for hollow load-bearing units. The maximum linear drying shrinkage shall be 0.030 percent for units with a concrete density of 120 lb. per cubic foot or more, and 0.040 percent for units with a concrete density of less than 120 lb. per cubic foot. Units shall be of dimensions that will lay up to 8-inch modules. Units shall include closer, jamb, header and special shapes and sizes required to complete the work indicated. Units having a bullnose of 1-inch radius shall be used throughout interior spaces at vertical external corners of interior concrete-masonry-unit walls, but not at door jambs, window jambs, and similar openings. Exposed-to-view or painted units in any one building shall be of the same appearance.

5.3 GROUT shall conform to ASTM C 476. Aggregate shall conform to ASTM C 404. Fine grout mixed to pouring consistency shall be used for filling cells containing anchor bolts.

5.4 JOINT REINFORCEMENT. Factory-fabricated from steel wire conforming to ASTM A 82, welded construction. Wire shall have zinc coat conforming to ASTM A 116, Class 1. All wires shall be a minimum of 9 gage.

5.4.1 Design. Reinforcement in single-wythe concrete-masonry-unit walls or partitions shall be of one design throughout, either ladder or truss design, having two or more deformed or smooth longitudinal wires. Longitudinal wires shall be spaced 2 inches plus or minus 1/8 inch less than the nominal width of the unit or wall in which placed. The distance between contacts of crosswires

with each outermost longitudinal wire of ladder or truss designs shall not exceed 6 inches for smooth longitudinal wires and 16 inches for deformed longitudinal wires. Intersections of X-bracing shall not exceed 24 inches on centers. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Walls containing joint reinforcement shall be provided with factory-formed pieces at corners and intersections of walls and partitions.

5.5 MORTAR for all masonry shall comply with the proportioning specification for Type S mortar set forth in ASTM C 270.

5.6 ADMIXTURE, other than antifreeze compounds, may be used in the mortar subject to approval. The admixture shall not adversely affect mortar bond or compressive strengths of mortar designed without use of admixture. The admixture shall not contain calcium chloride, chloride salts, or any other chemical that will deleteriously affect metals embedded in mortar including coatings.

5.7 PRECAST CONCRETE ITEMS. Splash blocks shall be factory-made units from a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, concrete shall be 3,000 psi using 1/2 inch to No. 4 nominal-size coarse aggregate, and reinforcement shall consist of not less than two No. 4 bars. Unless precast-concrete items have been subjected during manufacture to saturated-steam pressure of at least 120 lbs. per square inch for at least 5 hours, the items shall be either damp-cured for 24 hours or steam-cured. After curing, concrete shall be aged under cover for 28 days or longer. Exposed-to-view surfaces shall be free of surface voids, spalls, cracks, and chipped or broken edges and, unless otherwise specified, shall have a smooth dense finish. Each item shall be wetted and inspected for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected. Absorption on exposed surfaces shall be tested.

5.8 SPLASH BLOCKS shall be approximately as detailed on attached Standard Drawing 40-01-01, Sheet 4-1. Reinforcement shall be the manufacturer's standard.

5.9 REINFORCING STEEL BARS AND RODS shall conform to ASTM A 615 or A 616.

6. ERECTION.

6.1 GENERAL. No unit having a film of water or frost on its surface shall be laid. Cutting of individual masonry units prior to installation shall be with power masonry saw. Masonry shall be laid plumb, true to line, with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertical joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall

be removed and relaid with fresh mortar. Courses shall be so spaced that backing masonry will level off flush with the face work at all joints where ties occur. Chases and raked-out joints shall be kept free from mortar or other debris. The sizes of any two adjacent units shall be within permitted tolerances so that the difference between the vertical faces of such units shall not exceed 1/8 inch in exposed-to-view or painted walls and partitions. Units in exposed-to-view or painted walls and partitions shall be free from chipped edges or other imperfections detracting from the appearance of the finished work.

6.2 CUTTING AND FITTING, including that required to accommodate the work of others, shall be done by masonry mechanics. Wherever possible, full units of the proper size shall be used in lieu of cut units. Cut edges shall be clean, true and sharp. Cutting of units shall be with power masonry saw for exposed block. Masonry hammer and chisel will be permitted for unexposed block work. Openings shall be carefully cut, formed, or otherwise neatly made for recessed items and for electrical, plumbing, or other mechanical installations so that wall plates, cover plates, or escutcheons required by the installation will completely conceal the openings and will have bottoms in alignment with lower edge of masonry joints. Webs of hollow masonry units shall be cut the minimum required for the installation. Structural steel lintels shall be provided above openings over 12 inches wide for pipe, ducts, and cable trays, unless steel sleeves are used.

6.3 EMBEDDED ITEMS. Spaces around metal door frames and other built-in items shall be filled solidly with mortar. Openings around flush-mounted electrical outlet boxes in wet locations shall be pointed flush with mortar including flush joint above the box. Anchors, ties, wall plugs, accessories, flashings, pipe sleeves, and other items required to be built in shall be built in as the masonry work progresses. Anchors, ties, and joint reinforcement shall be fully embedded in mortar. Cells receiving anchor bolts shall be filled solidly with mortar or grout.

6.4 UNFINISHED WORK shall be stepped back for joining with new work. Toothing may be restored to only when specifically approved. Before laying new work, loose mortar shall be removed and the exposed joint shall be thoroughly cleaned.

6.5 MORTAR MATERIALS shall be accurately measured and mixed with as much water as may be necessary to produce the wettest workable consistency possible. Mortar shall be placed in final position within 2-1/2 hours after mixing. Mortar not used or that has started to set within this time interval shall be discarded. Mortar that has stiffened within the above time interval, because of evaporation of moisture from the mortar, shall be retempered to restore its workability.

6.6. JOINTING. Joints in exposed-to-view or painted walls and partitions, shall be tooled slightly concave with the mortar thoroughly compacted and pressed against the edges of the units. Tooling shall be done when the mortar is thumbprint hard. The tooled joints shall be finished to uniformly straight and true lines and surfaces, smooth, and free of tool marks.

6.6.1 Joint Widths shall be approximately 3/8-inch wide.

6.7 CONCRETE MASONRY UNITS. Concrete masonry units shall not be wetted before laying. Units shall be laid in running bond so that vertical joints between units will be located over the center of the units in the next course below and in alignment from bottom to top of wall. Units shall be full bedded in mortar under both face shells and webs where cells are to be filled with grout or concrete. Other units shall be full bedded under both face shells, but mortar shall not extend through the unit on web edges except where anchors or ties occur. All head joints shall be filled solidly with mortar for a distance in from the face of the unit or wall not less than the thickness of the longitudinal face shell. Jamb units shall be of the shapes and sizes to bond with wall units. No cells shall be left open in the face surfaces. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

6.7.1 Mortar, Grout, or Concrete Fill. Small-mesh wire fabric or expanded metal shall be embedded in mortar below cells of hollow units receiving mortar, grout, or concrete fill and shall extend across airspace of cavity wall where mortar, grout, or concrete fill is required. hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door jambs, and other spaces requiring fill shall be filled solid with grout, mortar, or concrete. Cells under lintel bearings on each side of openings shall be filled solid with grout, mortar, or concrete for full height of openings. Grout shall be used for filling cells of 4-inch nominal thick units. One cell of two-cell units and two cells of three-cell units shall be filled each side of jambs when lintel bearings are 8 inches. Solid units may be used instead of hollow units filled with grout, mortar, or concrete, except for installations requiring embedment of anchors in cells of hollow units.

6.7.2 Masonry Wall or Partition Intersections. Each course shall be masonry bonded at exterior corners and where masonry bond is indicated. Walls containing joint reinforcement shall be provided with factory-formed pieces at corners and intersections of walls and partitions in combination with ties or anchors.

6.8 LINTELS. Lintels shall extend beyond each side of masonry opening at least 8" for openings up to 8'-0" wide. Lintels shall be set with faces plumb and true, in a full bed of mortar. Lintels shall be set in full bed of mortar and blocked up as necessary to provide a full 1/2-inch clearance above top of frames.

6.9 SPLASH BLOCK shall be set under each downspout shown discharging onto grade.

7. JOINT REINFORCEMENT shall be installed as indicated. Reinforcement shall be placed so that longitudinal wires are centered on the wall and are fully embedded in mortar for their entire length. Reinforcement at openings shall extend not less than 24 inches beyond the end of lintels or to the end of the panel if the distance to the end of the panel is less than 24 inches. Reinforcement shall be lapped 6 inches or more for deformed longitudinal wires and 12 inches or more for smooth longitudinal wires. Factory-fabricated sections shall be installed at corners.

8. POINTING AND CLEANING. Mortar daubs or splashings, before setting or hardening, shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, all defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

8.1 CONCRETE-MASONRY UNIT SURFACES shall be dry-brushed at the end of each day's work and after any required pointing.

INSERT DWG. NO. 40-01-01 Sheet 4-1
November 1971

OFFICE OF THE DISTRICT ENGINEER,
OMAHA, NEBRASKA

SPLASH BLOCK

ZERO ACCIDENTS
SECTION 5A
STRUCTURAL STEEL

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| 3. Submittals | 7. Fabrication |
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1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.)

- | | |
|---------------------|--|
| TT-P-86G | Paint, Red-Lead-Base, Ready-Mixed |
| TT-P-615d
& Am-3 | Primer Coating: Basic Lead Silico
Chromate, Ready Mixed |
| TT-P-645A | Primer, Paint, Zinc Chromate, Alkyd Type |

1.2 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) PUBLICATIONS

Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings (November 1, 1978) with Commentary

Specification for Structural Joints using ASTM A325 or A490 Bolts (August 14, 1980)

1.3 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS

- | | |
|--------------------------|--|
| B18.22.1-1965
(R1975) | Plain Washers |
| B46.1-1978 | Surface Texture (Surface Roughness, Waviness
and Lay) |

1.4 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
SPECIFICATIONS

- | | |
|----------|--|
| A 36-81a | Structural Steel |
| A 307-80 | Carbon Steel Externally Threaded Standard
Fasteners |

1.5 AMERICAN WELDING SOCIETY (AWS) PUBLICATION

D1.1-82

Structural Welding Code - Steel

2. GENERAL. The AISC Specification for the Design, Fabrication & Erection of Structural Steel for Buildings shall govern the work. Welding shall be in accordance with AWS Code D1.1. High-strength bolting shall be in accordance with AISC Specification for Structural Joints Using ASTM A325 Bolts.

3. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit, for approval, items as listed in the following categories:

3.1 CATEGORY I.

3.1.1 Shop (Fabrication) detail of each structural steel member.

3.1.2 Erection diagrams of steel framing including welded and bolted connections. [Welds shall be indicated using standard welding symbols of the American Welding Society and shall indicate the size, shape, (spacing) and length of each weld.]

3.2 CATEGORY II.3.2.1 For Approval.

Detailed erection procedure.

3.2.2 For Information Only.

Certificates of compliance and certified copies of mill test reports.

Name and location of mill and shops.

Time and place of certification that each welder is qualified in accordance with AWS Code D1.1.

4. RESPONSIBILITY FOR ERRORS. The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members.

5. STORAGE. Material shall be stored out of contact with the ground in such manner and location as will minimize contamination and deterioration.

6. MATERIALS.

6.1 STRUCTURAL STEEL shall conform to ASTM A 36.

6.2 PAINT shall conform to Fed. Spec. TT-P-86, Type I or II; TT-P-615, Type I, II or V; or TT-P-645.

6.3 HIGH-STRENGTH BOLTS including nuts and washers shall conform to ASTM A 325.

6.4 CARBON STEEL BOLTS shall conform to ASTM A 307, Grade A.

6.5 PLAIN WASHERS, other than those in contact with high-strength boltheads and nuts, shall conform to ANSI B18.22.1, Type B.

7. FABRICATION shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings. Fabrication and assembly shall be done in the shop to the greatest extent possible. Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 microinches as determined by ANSI B46.1 and ends shall be square within the tolerances for milled ends specified in ASTM A 6. Structural steelwork, except shall be prepared for painting in accordance with the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings and primed with paint materials hereinbefore listed.

8. ERECTION of structural steel shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

8.1 CONNECTIONS. Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work.

8.2 BASE PLATES AND BEARING PLATES. Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be packed solidly with damp pack bedding mortar as specified in SECTION: CONCRETE prior to placing imposed loads, other than frame ties, on supported members.

8.3 FIELD WELDED CONNECTIONS. Field welded structural connections shall be completed before load is applied.

8.4 FIELD PRIMING. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

ZERO ACCIDENTS
SECTION 5B
MISCELLANEOUS METAL

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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 FEDERAL SPECIFICATIONS.

L-S-125B	Screening, Insect, Non-metallic.
FF-B-588C & Am-1	Bolt, Toggle: and Expansion Sleeve, Screw.
FF-S-111D	Screw, Wood.
FF-S-325 & Int. Am-3 (GSA-FSS)	Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry).
FF-W-84a & Am-3	Washers, Lock (Spring).
QQ-F-461c & Am-1	Floor Plate, Steel, Rolled.
QQ-S-766c & Int Am-6	Steel Plates, Sheets, and Strip - Corrosion Resisting
RR-G-661D	Grating, Metal, Bar Type (Floor, Except for Naval Vessels).
RR-G-1602A	Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels).
RR-S-001301 (FAA)	Safety Equipment, Climbing.

RR-W-365 Wire Fabric (Insect Screening)
 & Am-1

Tt-V-51F Varnish; Asphalt.

1.2 MILITARY SPECIFICATIONS.

MIL-M-17194C Metal, Expanded, Steel.
 & Am-2

MIL-C-18480B Coating Compound, Bituminous, Solvent, Coal
 Tar Base.

1.3 THE ALUMINUM ASSOCIATION PUBLICATIONS.

Designation System for Aluminum Finishes (7th Edition,
Sept. 1980).

Standards for Anodized Architectural Aluminum (5th Edition,
Oct. 1978).

1.4 AMERICAN INSURANCE ASSOCIATION (AIA) PUBLICATION.

National Building Code (1976; Amendments Dec. 1977).

1.5 AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI) STANDARD.

A 14.3-1974 Safety Requirements for Fixed Ladders.

1.6 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS.

A 36-81a Structural Steel.

A 48-76 Gray Iron Castings.

A 53-81a Pipe, Steel, Black and Hot-Dipped,
 Zinc-Coated, Welded and Seamless.

A 123-78 Zinc (Hot-Galvanized) Coatings on Products
 Fabricated from Rolled, Pressed, and Forged
 Steel Shapes, Plates, Bars and Strip.

A 386-78 Zinc Coating (Hot-Dip) on Assembled Steel
 Products.

A 475-78 Zinc Coated Steel Wire Strand.

A 525-81 Steel Sheet, Zinc Coated (Galvanized) by the
 Hot-Dip Process, General Requirements.

1.7 AMERICAN WELDING SOCIETY (AWS) STANDARD.

D1.1-82 Structural Welding Code -- Steel.

1.8 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS.

No. 101-1981 Code for Safety to Life from Fire in Buildings and Structures.

2. GENERAL. The following general requirements shall apply to all miscellaneous metal items unless otherwise noted or specified.

2.1 FABRICATION. The Contractor shall verify all dimensions and shall take necessary field measurements before fabrication. Design and fabrication details of all items shall be such as to provide adequate strength and stiffness.

2.2 SIZES AND GAGE shall be no smaller or lighter than those specified hereinafter, but slightly larger or heavier sizes and gages will generally be acceptable. Gages of materials shall be manufacturers standard gage.

2.3 GALVANIZING. Items specified to be galvanized shall be hot-dip processed after fabrication. Galvanizing shall be in accordance with ASTM A 123, A 86, or A 525, as applicable.

2.4 FASTENERS. All exposed-to-view fasteners shall generally match in color and finish, and shall harmonize with the material to which fasteners are applied.

2.5 COMPLETENESS. Materials, parts, bolts, anchors, supports, braces, and connections necessary for completion of the work shall be provided even though not precisely shown or specified. The necessary rebates, lugs and brackets shall be provided so that the work can be assembled in a neat and rigid manner.

2.6 INSTALLATION. Holes for bolts and screws shall be drilled or neatly punched. Poor matching of holes shall be cause for rejection of the work. Fastenings shall be concealed where practicable. Assembly and installation shall provide ample strength to completed installation. Joints exposed to the weather shall be formed to exclude water.

2.7 CORROSION PROTECTION - DISSIMILAR MATERIALS. Contact surfaces between dissimilar metals and aluminum surfaces in contact with concrete, masonry, pressure-treated wood or absorptive materials subject to wetting, shall (unless otherwise specified) be given a protective coating conforming to Military Specification MIL-C-18480 or to Fed. Spec. TT-V-51.

3. MATERIALS shall conform to the requirements specified for the particular item; and where these requirements are not specified in detail, the materials shall be suitable for the intended usage of the item.

3.1 ALUMINUM. Unless otherwise specified, aluminum items shall be in standard mill finish. When anodic coatings are specified hereinafter, the coatings shall conform to The Aluminum Association publication Standards for Anodized Architectural Aluminum, with treatment to a coating thickness not less than that specified for protective and decorative type finish in Designation System for Aluminum Finishes. Items to be anodized shall receive a polished-satin-finish pretreatment and a clear-lacquer overcoating conforming to the above-referenced standard.

3.2 ANCHORS.

3.2.1 Expansion Shields. Fed. Spec. FF-S-325.

3.2.2 Toggle Bolts. Fed. Spec. FF-B-588.

3.3 EXPANDED METAL shall conform to Military Specification MIL-M-17194, Type II, Class 1 or Class 2.

3.4 FASTENERS.

3.4.1 Bolts and Nuts shall be suitable for use intended.

3.4.2 Powder-Driven Fasteners may be used only when approved in writing.

3.4.3 Screws. Fed. Spec. FF-S-85, FF-S-92, and FF-S-111, as best suited for use intended.

3.4.4 Washers. Fed. Spec. FF-W-84 for lock washers. Flat washers shall be suitable for use intended.

3.5 HARDWARE. Unless otherwise specified, hardware provided as an integral part of miscellaneous metal shall conform to applicable ANSI Standard.

3.6 INSECT SCREEN. Fed. Spec. RR-W-365, Type II, III, or VII, 18 by 16 mesh, or Fed. Spec. L-S-125, Type II, bronze or aluminum color, 18 by 16 mesh.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit for approval, data as specified herein on the following:

4.1 CATEGORY I.

Miscellaneous structural items.

4.2 CATEGORY II.

4.2.1 Descriptive Data.

Ladder safety device.

5. NOT USED.

6. WORKMANSHIP. Miscellaneous metalwork shall be formed to correct shapes and sizes with sharp lines, angles, true curves, and finish all in accordance with approved shop drawings and samples. Drilling and punching shall produce clean true lines and surfaces. All items shall be accurately set to established lines and elevations and securely fastened in place.

6.1 WELDING shall be in accordance with AWS D1.1. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Connections to be exposed after installation shall be continuous welded. Exposed welds shall be ground smooth.

6.2 EXPOSED SURFACES of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush.

6.3 JOINTS where tight fits are required shall be milled to a close fit. Corner joints shall be coped or mitered, well formed, and in true alignment.

7. QUALIFICATION OF WELDERS. Welding to or on structural steel or miscellaneous items of structural steel such as lintels and ladders shall be performed by certified welders qualified in accordance with procedures covered in AWS D1.1 using procedures and materials and equipment of the type required for the work.

8. ANCHORAGE shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Slotted inserts shall be of types required to engage with the anchors and shall be approved.

9. STRUCTURAL STEEL DOORFRAMES shall be neatly mitered and welded at the corners with all welds ground smooth. Jams shall be provided with 2- by 1/4- by 12-inch bent metal adjustable anchors spaced not over 2 feet 67 inches on centers. The bottom of the frames shall be secured to the slab by means of angle clips and expansion bolts. Stops shall be made of 1-1/2- by 5/8-inch bars welded or top-screwed to the frame on not more than 18-inch centers. Screws shall be countersunk. Stops shall be attached to provide full continuous contact with the frame. Head members spanning more than 3 feet shall be reinforced. Necessary reinforcements shall be made. Frames shall be drilled and tapped to receive the hardware.

10. DOWNSPOUT BOOTS shall be cast iron. Shape and size shall be as indicated.

11. FLOOR GRATINGS AND FRAMES. Floor gratings shall be designed to support a live load of 100 pounds per square foot for the spans

indicated, and unless otherwise indicated shall conform to Fed. Spec. RR-G-661 or RR-G-1602. Edges of bar type gratings shall be banded with bars 1/8-inch less in depth than the bearing bars. Banding bars shall be flush with top of bearing bars. Frames of steel shapes and all-welded construction finished to match grating shall be provided as indicated. (Frames shall be provided with welded-on anchors.) (Floor gratings and frames shall be galvanized.)

12. HANDRAILS.

12.1 STEEL RAILINGS including pipe inserts in concrete shall be standard-weight steel pipe conforming to ASTM A 53. Pipe shall be 1-1/4-inch size. (Pipe railings shall be galvanized.)

12.1.1 Fabrication. Jointing of post, rail, and corners shall be by one of the following methods:

12.1.1.1 Flush-type Rail Fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8-inch hexagonal-recessed-head setscrews.

12.1.1.2 Mitered and Welded Joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

12.1.1.3 Railings May be Bent at Corners in lieu of jointing, provided bends are made in suitable jigs and that the pipe is not crushed.

12.1.2 Installation.

12.1.2.1 In Steel. Rails shall be installed by means of base plates bolted to stringers or structural framework.

13. LADDERS shall be steel fixed-rail type conforming to ANSI A14.3. (Ladders and accessories shall be galvanized.) Rungs shall be 3/4-inch solid-steel rods, fitted into punched holes in rails, welded and ground smooth. All splices and connections shall have a smooth transition with original members without projections that are sharp or more extensive than required for joint strength. Rails shall be fitted with brackets at the spacing indicated for anchorage to structure.

14. LADDER SAFETY DEVICE conforming to Fed. Spec. RR-S-1301 with (Type I) (Type II) carrier shall be provided for _____ and shall be completed in lanyard. Certification that the equipment meets the requirements of Fed. Spec. RR-S-1301, in lieu of testing as provided in the Federal Specification, shall be submitted.

15. MISCELLANEOUS PLATES AND SHAPES (for items that do not form a part of the structural steel framework, such as) lintels, sill angles, equipment mountings, and frames, shall be provided to complete the work. Miscellaneous plates and shapes shall conform to ASTM A 36.

16. SHOP PAINTING. Surfaces of ferrous metal, except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating. Bituminous primer, if used, shall conform to Fed. Spec. TT-V-51 or to Military Specification MIL-C-18480, but items to be finish painted shall be coated with other than a bituminous protective coating. Prior to shop painting surfaces shall be cleaned with solvents to remove grease and oil and with power wire-brushing or sandblasting to remove loose rust, loose mill scale, and other foreign substances. Surfaces of items to be embedded in concrete shall not be shop painted.

ZERO ACCIDENTS
SECTION 6A
ROUGH CARPENTRY

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| 2. Materials | 7. Installation of Sheathing |
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| 4. Moisture Content | |
| 5. Delivery and Storage | |

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 U.S. DEPARTMENT OF COMMERCE, PRODUCT STANDARDS.

- | | |
|--------------------|--------------------------------------|
| PS 1-74 | Construction and Industrial Plywood. |
| PS 20-70
& Am-1 | American Softwood Lumber Standard. |

1.2 AMERICAN PLYWOOD ASSOCIATION (APA) PUBLICATION.

Plywood Encyclopedia (November 1978).

1.3 WEST COAST LUMBER INSPECTION BUREAU (WCLB) PUBLICATION.

No. 16 Standard Grading and Dressing Rules for Douglas Fir, Western Hemlock, Western Red Cedar, White Fir, Sitka Spruce Lumber (September 1, 1970, Rev. Jan. 1, 1981).

1.4 WESTERN WOOD PRODUCTS ASSOCIATION (WWP) PUBLICATION.

Western Lumber Grading Rules (June 1, 1981 and Supplement 1.).

2. MATERIALS shall conform to the respective specifications and other requirements specified below.

2.1 ACCESSORIES AND NAILS.

2.1.1 Screws. Plywood to metal self-drilling metal screws of the type, size and finish best suited for the intended use.

2.2 SHEATHING. Plywood for interior toilet room for roof sheathing.

2.2.1 Plywood. Prod. Std. PS 1.

2.2.2 Wood. Sheathing shall be 1/2-inch thick for supports, 24-inches on center.

3. GRADING AND MARKING. Plywood shall bear the grademark, stamp or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on a material shall be in accordance with the Rule or Standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.

4. MOISTURE CONTENT. At the time materials are delivered and when installed in the work, their moisture content shall be in accordance with Standard under which the product is produced.

5. DELIVERY AND STORAGE. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from extreme changes in temperature and humidity.

6. INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS.

6.1 GENERAL. Members shall be closely fitted, accurately set to required lines and levels, and rigidly secured in place.

6.2 GENERAL USE PLYWOOD shall be installed as recommended in the APA Plywood Encyclopedia.

7. INSTALLATION OF SHEATHING.

7.1 PLYWOOD SHEATHING shall be applied with edges 1/8-inch apart at side joints and 1/16-inch apart at end joints, and screwed at supported edges at 6-inches on center and at intermediate supports 12-inches on center. Fastening of edges shall be 3/8-inch from the edges.

ZERO ACCIDENTS
SECTION 7A
CAULKING AND SEALANTS

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Attachments: Standard Detail Dwg. No. 40-01-01, Sheet(s) 7-3 (and 7-4)

1. APPLICABLE PUBLICATIONS. The publications listed below for a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.)

TT-C-00598C (COM-NBS) & Am-1	Calking Compound, Oil and Resin Base Type (for Building Construction).
TT-S-00227E & Am-3	Sealing Compound: Elastomeric Type, Multi-Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
TT-S-00230C & Am-2	Sealing Compound: Elastomeric Type, Multi-Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
TT-S-001543A	Sealing Compound: Silicone Rubber Base (for Calking, Sealing, and Glazing in Buildings and Other Structures).
TT-S-001657	Sealing Compound - Single Component, Butyl Rubber Based, Solvent Release Type (for Buildings and Other Types of Construction).

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
SPECIFICATION.

D 217 82	Cone Penetration of Lubricating Grease.
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2. GENERAL REQUIREMENTS. Calking or sealant shall be provided in joints as indicated or specified. The joint design, shape, and spacing shall be as indicated. Mixing shall be in accordance with instructions provided by the manufacturer of the sealants.

3. SUBMITTALS.

3.1 CATEGORY I. None.

3.2 CATEGORY II.

3.2.1 For Approval.

3.2.1.1 Manufacturers' Descriptive Data for calking, sealants, primers, and backstop materials. Descriptive data for elastomeric sealants shall include shelf life and curing time, and mixing instructions for two component sealants.

3.2.1.2 Samples as follows:

One-component sealants - 5 cartridges or equivalent bulk material.

Two-component sealants - sufficient individual components to produce a two-quart sample.

Calking compound - 2 cartridges or equivalent.

Primer - 1/2 pint.

Samples shall be furnished for each lot of each sealant. Labels on the sample containers shall include the same information as required for containers delivered to the job. Each sample shall be positively identified with the corresponding lot of material delivered to the project. Testing of the initial submittal of sealant material for compliance with the specifications will be done by and at the discretion of the Government at Government expense. If testing of the samples indicates non-compliance with the applicable specifications, the material shall be replaced and samples of the replacement material shall be submitted by the Contractor. These samples of replacement material will be tested by the Government, but the cost of such testing will be deducted from payments due the Contractor at the rate of \$600 per test for Fed. Spec. TT-C-598 and TT-S-1657, and \$550 per test for each Fed. Spec. TT-S-227, TT-S-230, and TT-S-1543. Samples shall be furnished by the Contractor for test 75 days in advance of need for TT-S-227, TT-S-230, and TT-S-1543, and 30 days in advance of need for other materials. The Contractor will be entitled to no extension of time or additional payment due to any delay caused by the requirements for submittal of samples and testing specified herein.

3.2.2 For Information Only.

3.2.2.1 Certificates of Compliance shall be submitted for calking and sealants stating that the materials conform to the specified requirements.

3.2.2.2 Certified Laboratory Test Reports showing that the calking and sealants have been testing within the last 12 months and meet the requirements of the applicable specification.

4. ENVIRONMENTAL REQUIREMENTS. The ambient temperature shall be within the limits of 40 to 90 degrees F. when the calking and sealants are applied.

5. DELIVERY AND STORAGE. Materials shall be delivered to the job in the manufacturer's original unopened containers. The containers shall include the following information on the label: supplier, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time when applicable at the standard conditions for laboratory tests. Calking compound or components outdated as indicated by shelf life shall not be used. Materials shall be carefully handled and stored to prevent inclusion of foreign materials or exposure to temperatures exceeding 90 degrees F. Sealant tape shall be handled and stored in a manner that will not deform the tape.

6. MATERIALS shall conform to the applicable Federal Specifications and to other requirements specified herein.

6.1 NO. 1 CALKING COMPOUND shall be calking compound conform to TT-C-598, Type I.

6.2 NO. 2 SEALANT shall be a two-component, elastomeric-type compound conforming to TT-S-227, Type II, Class A. The compound shall be supplied in pre-measured kit form for on-the-job mixing.

6.3 NO. 3 SEALANT shall be a single-component, butyl rubber based compound conforming to TT-S-1657. Type I compound shall be used for joints in horizontal and vertical surfaces.

6.4 NO. 4 SEALANT shall be a single-component, elastomeric-type compound conforming to TT-S-230, Type II, Class A or TT-S-1543, Class A.

6.5 NO. 10 SEALANT shall be foamed-urethane strips. For exterior use, strips shall be saturated with a butylene waterproofing material or shall be asphalt impregnated. For interior use, strips shall be closed cell type and shall be white or light color. The sealant shall be furnished in the proper width to seal out dust, moisture, and weather when compressed to the extent recommended by the manufacturer.

6.6 NO. 11 SEALANT shall be a single-component, silicone-based, low modulus, elastomeric compound conforming to Fed. Spec. TT-S-230, Type II, or TT-S-1543, except that the material furnished under either

specification shall exceed the requirements for Class A sealant. The sealant shall be capable of resisting compression-extension cycling of plus and minus 50 percent of the nominal half-inch width (100 percent total joint movement) as specified in the durability requirement as described in paragraph 4.3.9.4.1 of the Fed. Spec., and except that the hardness (durometer) shall be not less than 12 nor more than 50 as determined by paragraph 4.3.4 of the Fed. Spec.

6.7 ACOUSTICAL SEALANT. Synthetic rubber or polymeric-based material.

6.7.1 Consistency. ASTM D 217, 290 to 310.

6.7.2 Aging. Slightly tacky at 160 degrees F. after 50 days.

6.7.3 Accelerated Aging. No significant change after 260 hours in weatherometer.

6.7.4 Staining. None.

6.7.5 Solids Content. Approximately 80 to 90 percent.

6.7.6 Oil Migration. None.

6.8 ALUMINUM PAINT for use with No. 1 calking compound shall be ready-mixed paint.

6.9 PRIMER. Primer for sealants shall be as recommended by the sealant manufacturer and shall have been tested for staining and durability with the sealant to be used and on samples of the surfaces to be sealed.

6.10 BACKSTOP MATERIAL shall be resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, oilless dry jute, or rope yard. Backstop material shall be nonabsorbent, nonstaining, and compatible with the sealant used. Tube or rod stock shall be rolled into the joint cavity.

6.11 BOND PREVENTIVE MATERIALS shall be pressure-sensitive adhesive polyethylene tape, aluminum foil, or wax paper.

7. SURFACE PREPARATION. The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from all joint surfaces to be sealed. Oil or grease shall be removed with solvent and surfaces shall be wiped with clean cloths.

7.1 CONCRETE AND MASONRY SURFACES. Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing.

Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

7.2 STEEL SURFACES to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

7.3 ALUMINUM SURFACES of windows and door frames in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coatings shall be as recommended by the manufacturer of the aluminum work and shall be nonstaining.

8. APPLICATION.

8.1 PAPER MASKING TAPE shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or compound smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

8.2 BOND-PREVENTIVE MATERIALS for sealants shall be installed on the bottom of the joint cavity and on other surfaces as indicated to prevent the sealant from adhering to the surfaces covered by the bond-preventive materials. The materials shall be carefully applied to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those to be covered by the bond-preventive materials. Backstop material with bond-breaking characteristics may be installed in lieu of bond-preventive materials specified.

8.3 BACKSTOPS. The back or bottom of joints constructed deeper than indicated shall be packed tightly with backstop material to provide a joint of the depth indicated. Where necessary to provide a backstop for calking compound, the joint shall be packed tightly with rope yarn.

8.4 PRIMER shall be used on concrete masonry units, wood, or other surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not receive primer.

8.5 NO. 1 CALKING COMPOUND. Compound shall be gun-applied with a nozzle of proper size to fit the width of joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Calking shall be uniformly smooth and free of wrinkles and shall be left sufficiently convex to result in a flush joint when dry. One coat of aluminum paint shall be applied over joint after compound has dried sufficiently to develop a surface skin so that painting will not deform the surface of the joint.

8.6 NOS. 2, 3, 4 and 11 SEALANT. Compound shall be gun-applied with a nozzle of proper size to fit the width of joint indicated and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Sealant shall be uniformly smooth and free of wrinkles. Joints shall be tooled slightly concave after sealant is installed. When tooling white or light-color sealant, dry or water-wet tool shall be used.

8.7 NO. 10 SEALANT. In concrete, masonry, or plaster work, a primer shall be applied if recommended by the manufacturer. If preformed joints, the sealant shall be precompressed to less than the joint width and inserted in the joint cavity. The asphalt-impregnated type may be used only where specifically approved in joints not subject to attack by solvents and where appearance is not important.

8.8 ACOUSTICAL SEALANT shall be applied only to concealed surfaces. A full bead shall be gunned into joints or openings. Piping and backs of electrical boxes shall be covered with a sealant and perimeters sealed.

9. MISCELLANEOUS APPLICATIONS.

9.1 CONTROL JOINTS in poured concrete walls shall be sealed with a continuous bead of sealant No. 2 or 4, 3/8 inch deep placed over a bond breaker on the bottom of the groove. Immediately after placing, the sealant shall be tooled flat or slightly concave with sufficient pressure to force out air inclusions and to force intimate contact with groove side walls.

9.2 PERIMETERS OF FRAMES IN EXTERIOR WALLS (windows, doors, louvers, etc.) shall be sealed with sealant No. 2 or 4. Joint width shall be approximately 1/4-inch. Backstop material shall be used as needed to provide a joint depth of 1/4-inch.

9.3 REGLECTS shall be uniformly filled after installation of the flashing, using sealant No. 2 or 4 or the sealant recommended by the manufacturer of the reglet. Where the sealant will be in contact with asphaltic or bituminous materials, a sealant based on similar asphalt or bituminous materials shall be used.

10. CLEANING. The surfaces adjoining the calked and sealed joints shall be cleaned of smears and other soiling resulting from the calking and sealing application as work progresses.

INSERT JOINT SHAPE SYMBOLS
OFFICE OF THE DISTRICT ENGINEER
OMAHA, NEBRASKA

NOVEMBER 1971
DRAWING NO. 40-01-01
SHEET 7-3

INSERT JOINT SHAPE SYMBOLS
OFFICE OF THE DISTRICT ENGINEER
OMAHA, NEBRASKA

NOVEMBER 1971
DRAWING NO. 40-01-01
SHEET 7-4

ZERO ACCIDENTS
SECTION 7B
VENTILATORS; ROOF; GRAVITY - TYPE

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| 4. Materials | 6. Installation |

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.)

QQ-S-775E	Steel Sheets, Carbon, Zinc-Coated
& Int. Am-1	(Galvanized) by the Hot-Dip Process

1.2 AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI) PUBLICATION

A58.1-1982	Minimum Design Loads for Buildings and Other Structures.
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2. GENERAL. The ventilators shall be of the stationary type, constructed of zinc-coated steel and shall be the product of a manufacturer regularly engaged in the manufacture of roof ventilators. The ventilators shall be of the sizes indicated and shall be furnished complete with bases, flashing flanges, dampers, and bird screens.

3. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit for approval, data as specified herein on the following:

3.1 CATEGORY I. None

3.2 CATEGORY II. Descriptive data - Each type of roof ventilator including dimensions, details of construction, gages of metal, methods of operation including dampers, and method of installation.

4. MATERIALS shall be manufacturers' standard materials and conform to the requirements specified herein. Metals shall be of temper best suited for forming and intended use.

4.1 ZINC-COATED STEEL shall conform to Fed. Spec. QQ-S-775, Class c.

5. DESIGN AND DETAILS OF FABRICATION AND CONSTRUCTION

5.1 DESIGN. The ventilators shall be weatherproof and shall be free from backdraft except in the event of interior negative pressure. The design shall be such that the ventilators will be capable of self-cleaning by the action of the elements with provision for carrying water and normal wind-transported soil matter to the outside. The ventilators shall be designed for wind loads in accordance with ANSI A58.1, but in no case shall the installed design be for less than 80 miles per hour wind load. The structural bracing shall be properly spaced to accommodate this loading and in accordance with the design requirements of the covering material. Ridge type ventilators shall be equipped with wind jump diaphragms spaced at each structural frame to afford efficient ventilation regardless of wind direction.

5.2 CAPACITY. The capacity of the ventilators shall be 2600 cubic feet per minute, with a wind velocity of 4 miles per hour, a stack height of 30 feet, and a temperature difference of 10F. The ventilators shall be of the size indicated on the drawings.

5.3 BASES. The base provided with the ventilators shall be factory-formed of the type indicated and shall be of the same material as the hoods, and shall be of a thickness necessary to meet the design requirements specified herein. Base shall be provided with flashing flanges extending over the adjoining roof surfaces a sufficient distance to provide for proper connection with the roof. Bases for ventilators to be installed on built-up roofing shall be suitable for raised curb mounting. Curb flanges of the base shall be formed as cap flashing extending at least 4 inches over roofing base. Where indicated or required, shafts of ventilators shall be extended through the supporting construction a sufficient distance to permit attachment of vent ducts.

5.4 DAMPERS shall be constructed of the same material as the ventilators and shall be provided with chains or cables, and required hardware for satisfactory operation. Dampers shall be of a type that will completely close the opening or that may be set securely at any desired open position. Dampers for ridge ventilators shall be manually operated either individually or as indicated.

5.5 CONSTRUCTION. Ventilators shall be adequately reinforced and well braced, with joints properly formed. Edges shall be wired or beaded, where necessary, to insure rigidity. Galvanic action between different metals in direct contact shall be prevented by nonconductive separators. Bolts, rivets, and other fastenings used in connection with protected metal shall be corrosion-resistant steel. All soldering shall be even and smooth. Ridge ventilators shall be constructed in sections suitable for shipment and installation. Joints between sections shall be made in such manner as to be waterproof and properly allow for expansion and contraction. Suitable end fittings shall be provided for each continuous run of ventilator.

5.6. SCREENS shall be provided with frames of the same material as the material used in the ventilators and shall be securely attached in such manner as to permit easy removal for cleaning on the roof. Screens for ridge ventilators shall be in sections to match ventilator sections, with cross members of frames flanged for bolted connections.

6. INSTALLATION of ventilators shall be properly coordinated with other trades. Anchors, attachments, and other items to be built in shall be coordinated for installation as the work progresses. Ventilators shall be rigidly installed in a weathertight and watertight manner and shall be free from vibration due to wind. Following installation, all operating devices shall be adjusted for proper operation.

ZERO ACCIDENTS
SECTION 8A
STEEL DOORS AND FRAMES

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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 DOOR AND HARDWARE INSTITUTE (DHI) PUBLICATION.

The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames, and Builders Hardware (1977).

1.2 STEEL DOOR INSTITUTE (SDI) SPECIFICATION.

100-78 Standard Steel Doors and Frames.

2. SUBMITTALS.

2.1 CATEGORY I.

Descriptive data for each type of door and frame showing assembly, hardware reinforcement and location, frame anchorage, metal thickness, core material, and factory finish.

Certification that doors and frames comply with all requirements of SDI 100.

3. DELIVERY AND STORAGE. To provide protection during shipment, knockdown-type frames shall be securely strapped in bundles. Materials shall be delivered to the site in undamaged condition, and stored out of contact with the ground and under a weathertight covering, permitting good air circulation. Whenever damage becomes evident, abraded, scarred, or rusty, areas shall be cleaned and touched up with the paint used for the shop painting.

4. GENERAL REQUIREMENTS FOR DOORS AND FRAMES. Doors and frames shall be factory fabricated products conforming to SDI 100 and the additional requirements specified herein. Doors and frames shall be prepared to receive hardware conforming to the templates and

information provided under SECTION: HARDWARE, BUILDERS' (GENERAL PURPOSE). Rubber silencers shall be installed on door frames.

4.1 INTERIOR DOORS shall be Style 2, Full Flush.

4.2 EXTERIOR DOORS are specified in SECTION: METAL BUILDINGS.

5. INSTALLATION shall conform to DHI publication The Installation of Commercial Steel Doors and Steel Frames, and Builders Hardware. Doors shall be installed in conjunction with the application of hardware.

ZERO ACCIDENTS
SECTION 8B
HARDWARE; BUILDERS' (GENERAL PURPOSE)

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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the test by the basic designation only.

1.1 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS.

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|-------------|--|
| A156.1-1981 | Butts and Hinges. |
| A156.2-1976 | Locks and Lock Trim. |
| A156.4-1980 | Door Controls - Closers. |
| A156.5-1978 | Auxiliary Locks & Associated Products. |
| A156.6-1979 | Architectural Door Trim. |
| A156.7-1981 | Template Hinge Dimensions. |

1.2 DOOR AND HARDWARE INSTITUTE (DHI) PUBLICATIONS.

Keying Procedures, Systems and Nomenclature
(January 1978).

Recommended Locations for Builders' Hardware
for Standard Steel Doors and Frames (1975).

1.3 BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA) STANDARDS.

- | | |
|-----------|---|
| 1301-1981 | Materials & Finishes. |
| | Certified Products Directory (Current Issue). |

2. GENERAL. Hardware shall conform to the applicable requirements of the standards listed herein, unless otherwise specified. Reinforcement for hardware in metal doors shall be as specified in SECTION: STEEL DOORS AND FRAMES.

3. TEMPLATES. The Contractor shall furnish templates or information otherwise necessary to enable the door and frame manufacturer to make proper provision in his work to receive the specified hardware. Where two or more articles of hardware are to be mounted on the same door, the Contractor shall effect proper coordination between the manufacturers of the different articles. Templates of hinges shall conform to ANSI A156.7.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data as specified herein.

4.1 CATEGORY I.

4.1.1 Certificate of Compliance shall be submitted for approval, attesting that hardware items proposed conform to all specified requirements including the ANSI or BHMA Standards. Listing in the current BHMA Certified Products Directory will be accepted in lieu of certificates. Submit descriptive data for all items, in sufficient detail to show compliance. Submit keying schedule developed in accordance with DHI publication "Keying Procedures, Systems and Nomenclature".

4.2 CATEGORY II. (For Information Only)

4.2.1 Hardware Schedule. Following approval of the Category I submittal, the Contractor shall submit three (3) copies of the Hardware Schedule listing all of the materials to be furnished. A list of abbreviations and template numbers, and the keying schedule shall be furnished with the schedule. For each item, the schedule shall include the following information:

4.2.1.1 Quantities.

4.2.1.2 Location and hardware set identification.

4.2.1.3 Description of item.

4.2.1.4 Manufacturers catalog number.

4.2.1.5 ANSI or BHMA standard type or function number corresponding to manufacturer's catalog number.

4.2.1.6 Sizes for hinges, closer, etc.

4.2.1.7 Keying symbol.

4.2.2 Catalog Data showing manufacturers' recommended sizes for hinges, closers, etc., shall be furnished with the Hardware Schedule.

5. PACKAGING, MARKING AND LABELING. Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, properly marked or labeled so as to be readily identifiable with the approved hardware schedule. Each change-key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and on the hardware schedule.

6. FINISHES of the following types shall conform to the finishes identified under BHMA Standard 1301, and shall conform to the requirements of the standard under which the item is specified. Base materials shall be of the material identified by the finish number. Where painting of primed surfaces is required, painting is specified in SECTION: PAINTING, GENERAL.

6.1 HINGES shall have the following finishes:

6.1.1 For out-swinging exterior doors, hinges shall be 600 on steel.

6.1.2 For room side of doors to toilet room, hinges shall be 626 on brass or bronze.

6.2 LOCKS, LOCK TRIM, AND DOOR TRIM shall have the following finishes:

6.2.1 For exterior doors, lock and trim shall be 626 on brass or bronze.

6.2.2 For room side of doors to toilet rooms, lock and trim shall be 626 on brass or bronze.

6.3 DOOR CLOSERS shall have finish 600.

7. FASTENINGS of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete, or other masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel, as applicable. Fasteners exposed to the exterior or elsewhere as noted shall be one-way screws and other approved tamperproof screws.

8. KEYING. Cylinder locks shall be keyed in sets or subsets in accordance with the KEYING INSTRUCTIONS. Keys for cylinder locks shall be stamped with change number and with the inscription "U.S. Property - Do Not Duplicate". Keys shall be supplied as follows:

Cylinder Locks (2) change keys each lock.

Master Keyed Sets ___ keys each.

Grand Master ___ keys total.
Keys

Construction ___ keys total.
Master Keys

8.1 EXISTING MASTER KEY SYSTEM. Locks shall be keyed into the existing master keying system. The Contractor shall obtain from the Contracting Officer the existing keying system manufacturer and Master Key Number. New key changes shall be fully coordinated with the existing system to avoid duplication.

8.2 KEYWAY. Cylinders shall have (five)(six) pins with paracentric keyway.

8.3 CONSTRUCTION MASTER KEY. Cylinder locks shall be furnished with the manufacturer's standard construction masterkey system. The permanent keys shall be sent by the lock manufacturer to the Contracting Officer by registered mail.

8.4 REMOVABLE CORE CYLINDERS. Cylinder locks for doors shall be provided with cylinders of the removable core type. Provide 1 spare core. provide the specified number of key blanks for each spare core.

8.5 DELIVERY OF KEYS. The keys shall be turned over to the Contracting Officer properly tagged and designated as to location, and arranged in a container in sets or subsets as scheduled.

9. LOCKS AND LATCHES. To the maximum extent possible, locksets, latchsets and deadlocks shall be the products of a single manufacturer. Installed locksets shall provide the required degree of resistance to unauthorized entry. Mortise-type locks and latches for doors 1-3/4 inches thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Mortise locks shall have armored fronts. Trim for mortise locks and latches shall be escutcheon, minimum 7 by 1-3/4 inches with wrought top and cast shank, and conform to the requirements for wrought trim in accordance with ANSI A156.2. Manufacturer's standard plain design shall be used.

9.1 CYLINDER LOCKS. Cylinders for cylinder locks, and the cylinder locks, shall be the product of the same manufacturer.

9.2 LOCKSETS AND LATCHSETS shall conform to ANSI A156.2, conforming to Series 1000, Grade 2.

10. AUXILIARY HARDWARE shall conform to BHMA 1201.

10.1 DOOR STOPS shall be Type L02252 for wall installation. A door stop shall be provided at each interior hinged door.

11. BUTTS AND HINGES. Hinges shall conform to ANSI 156.1. Hinges used on metal doors and frames shall also conform to ANSI A156.7. Hinges shall conform to the hinge manufacturer's printed recommendations and shall be indicated on the hardware schedule.

11.1 HINGES FOR REVERSE BEVEL DOORS WITH LOCKS shall be safety stud type, or shall have pins that are made non-removable by means such as a set screw in the barrel. Set screw shall be inaccessible when the door is in the closed position.

11.2 CONTRACTOR'S OPTION. hinges with anti-friction bearings may be furnished in lieu of ball bearing hinges.

11.3 CLASSIFICATION. Butt hinges for application on the various doors and frames shall be in accordance with the following:

	<u>Door Material</u>
<u>Jamb Material</u>	<u>Hollow Metal</u>
Pressed Steel:	Full Mortise.

11.4 TYPES. Butt hinges shall conform to the following types.

	<u>Wrought Steel</u>	<u>Wrought Brass or Bronze</u>
Classification	Grade 1	Grade 3
Full Mortise	A8111	A2133

11.5 GRADE 1 HINGES shall be used for doors subject to very high frequency use, unusually heavy doors including all lead lined doors, doors 42 inches wide or wider, exterior doors equipped with overhead holder, and doors subject to other unusual stress situations.

11.6 GRADE 3 HINGES shall be used for all other applications.

11.7 NUMBER OF HINGES. Provide three hinges (1-1/2 pair) for doors from 5 feet to 7 feet 6 inches in height, and one additional hinge for each additional 30 inches or fraction thereof in height.

	<u>Wrought Steel</u>	<u>Wrought Brass or Bronze</u>
Classification	Grade 3	Grade 3
Full Mortise	A8111 A8112 A8133	A2111 A2112 A133

11.8 GRADE 3 HINGES shall be used for all other applications.

11.9 NUMBER OF HINGES. Unless otherwise specified in paragraph: HARDWARE SETS, provide two hinges (1 pair) for each door leaf up to 5 feet high, three hinges (1-1/2 pair) for doors from 5 feet to 7 feet 6 inches in height, and one additional hinge for each additional 30 inches or fraction thereof in height.

12. DOOR CLOSING DEVICES of the following types shall conform to ANSI A156.4.

12.1 SURFACE TYPE CLOSERS shall be series C02021 with options FT-4G (3.8.7), integral stop. Size requirements shall conform to the manufacturer's published recommendations and shall be shown on the Contractor's Hardware Schedule. Closers for out-swinging exterior doors shall have standard or long parallel arms or shall be top jamb mounted as required for the particular opening. Surface type closers shall be the products of one manufacturer only.

13. MISCELLANEOUS

13.1 METAL THRESHOLDS shall be extruded aluminum, flat type with fluted top and shall provide proper clearance and an effective seal, ANSI 156.6 series J601.

13.2 WEATHERSTRIPPING shall be closed cell form neoprene, 1/8-inch thick on head sill and jambs of exterior doors. Mount neoprene strip in aluminum or bronze housing, 1-1/4 inches wide. Aluminum housing to have mill finish. Weatherstripping shall be adjustable by means of slotted holes for screw mounting.

14. APPLICATION. Hardware shall be located on doors in accordance with DHI Publication, "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames". When approved, slight variations in locations or dimensions will be permitted.

15. DOOR-CLOSING DEVICES shall be installed and adjusted in strict accordance with the templates and printed instructions supplied by the manufacturer of the devices.

16. THRESHOLDS shall be bedded in sealant and securely anchored in place.

17. KEYING INSTRUCTIONS. The building shall be masterkeyed in one series.

ZERO ACCIDENTS
SECTION 8C
GLASS AND GLAZING

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| 1. Applicable Publications | 5. Materials |
| 2. General | 6. Installation |
| 3. Submittals | 7. Cleaning |
| 4. Delivery and Storage | |

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS.

DD-G-451D Glass, Float or Plate, Sheet, Figured (Flat, for Glazing, Mirrors and Other Uses).

1.2 FLAT GLASS MARKETING ASSOCIATION (FGMA) PUBLICATION.

Glazing Manual (1980 Edition).

2. GENERAL. Glass shall be provided in the locations indicated. Glazing may be performed in the shop or in the field using glass of the quality and thickness specified or indicated.

3. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit for approval, data as specified herein on the following:

3.1 CATEGORY I. None.

3.2 CATEGORY II.

3.2.1 Samples. Two each, 10-inch by 12-inch, factory labeled.

3.2.2 Guarantees. Insulating glass units shall be guaranteed not to develop material obstruction to vision as a result of dust or film formation on the inner glass surfaces caused by failure of the hermetic seal, other than through glass breakage, within a ten-year period following installation.

3.2.3 Manufacturer's Descriptive Data for all glass and glazing materials.

3.2.4 Manufacturer's Installation Instructions for each type of glass and frame combination.

3.2.5 Certificates of Compliance.

Certification from manufacturer that glass conforms to requirements specified herein. Labels or marking affixed to the glass will be accepted in lieu of certificates.

4. DELIVERY AND STORAGE. Glazing compounds shall be delivered to the site in the manufacturer's unopened containers. Glass shall be stored in safe, dry locations and shall not be unpacked until needed for installation.

5. MATERIALS.

5.1 GLASS shall conform to the requirements of Fed. Spec. DD-G-451 unless specified otherwise.

5.1.1 Insulating Glass Units. Formed of two lites of glass separated by a 1/4-inch dehydrated air space, hermetically sealed. Both lites shall be Type I, Class I, Quality q3, 1/8-inch thick glass.

5.2 SETTING MATERIALS.

5.2.1 Glazing Compound and Preformed Glazing Sealants. Suitable type approved for the application and in accordance with applicable portions of the FGMA Glazing Manual. Materials which will be exposed to view and unpainted shall be gray or neutral color.

5.2.2 Glazing Accessories. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation, including glazing points, clips, shims, angles, beads, setting blocks, and spacer strips. Ferrous metal accessories which will be exposed in the finished work shall have a finish that will not corrode or stain while in service.

6. INSTALLATION. Glazing shall be performed in accordance with the approved installation instructions of the glass manufacturer.

7. CLEANING. Glass surfaces shall be thoroughly cleaned, with labels, paint spots, putty, and other defacement removed, and shall be clean at the time the work is accepted.

ZERO ACCIDENTS
SECTION 9A
PAINTING (GENERAL)

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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.).

TT-C-555B & Am-1	Coating, Textured (for Interior and Exterior Masonry Surfaces).
TT-E-489G	Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces).
TT-E-505a & Am-3	Enamel, Odorless, Alkyd, Interior, High Gloss, White and Light Tints.
TT-E-506K	Enamel, Alkyd, Gloss, Tints and White (for Interior Use).
TT-E-508C	Enamel, Interior, Semigloss, Tints and White.
TT-E-509b & Am-1	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints.
TT-E-543a & Am-1	Enamel, Interior, Undercoat, Tints and White.
TT-E-545B & Am-1	Enamel, Odorless, Alkyd, Interior-Undercoat, Flat, Tints and White.

TT-F-1098D	Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, etc.).
TT-P-239 & Am-1	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-30E	Paint, Alkyd, Odorless, Interior, Flat, White and Tints.
TT-P-38D & Am-1	Paint, Aluminum, Ready-Mixed.
TT-P-95C & Am-1	Paint, Rubber: For Swimming Pools and Other Concrete and Masonry Surfaces.
TT-P-102E	Paint, Oil, Alkyd Modified, Exterior, White and Tints.
TT-P-641G & Am-1	Primer Coating; Zinc Dust-Zinc Oxide (for Galvanized Surfaces).
TT-P-645A	Primer, Paint, Zinc Chromate, Alkyd Type.
TT-P-650C & Am-1	Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard).
TT-P-1511B	Paint, Latex (Gloss and Semigloss, Tints and White) (for Interior Use).
TT-P-1728A	Paint, Latex-Base, Interior, Flat, Deep-Tone.
TT-P-001984	Primer Coating, Latex Base, Exterior, (Undercoat for Wood), White and Tints.
TT-S-179B & Am-1	Sealer, Surface: Pigmented Oil, for Plaster and Wallboard.

1.2 FEDERAL STANDARDS (Fed. Std.)

No. 595a. Colors.
& Change
Notices 1,
2, 3, 4, 5,
& 6.

1.3 MILITARY SPECIFICATIONS (Mil. Spec.)

DOD-P-15328D	Primer (Wash), Pretreatment, (Formula No. 117 for Metals) (Metric).
MIL-P-26915B	Primer Coating, Zinc Dust Pigmented, for Steel Surfaces.

MIL-P-52324 Paint, Oil, Alkyd, Exterior, White and Light Tints.

1.4 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATION.

C 150-81 Portland Cement.

1.5 STEEL STRUCTURES PAINTING COUNCIL (SSPC) SPECIFICATIONS.

SSPC-PA 1-82 Shop, Field, and Maintenance Painting.

SSPC-Paint 9-82 White (or Colored) Vinyl Paint.

SSPC-SP 6-82 Commercial Blast Cleaning.

2. DEFINITION. The term "paint", as used herein, includes emulsions, enamels, paints, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coats.

3. PACKAGING, LABELING AND STORAGE. Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paint shall be stored on the project site or segregated at the source of supply sufficiently in advance of need to allow 30 days for testing. Emulsion paints shall be stored to prevent freezing.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data as specified herein on the following:

4.1 CATEGORY I. None.

4.2 CATEGORY II.

4.2.1 Proprietary Brand Names. When the required quantity of a particular color is 25 gallons or less, submit for approval the names of the proprietary brands of materials that are proposed to be substituted for the specified materials.

4.2.2 Sample Panels shall be submitted for approval. For each color specified, submit a sample of the complete liquid glaze coating system applied to a panel of the same material as that on which the coating will be applied in the work. The approved sample panels will be used for quality control of the application of the glaze coating system.

4.2.3 Manufacturer's Instructions. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing time and drying time between coats shall be furnished for liquid glaze coatings. For the liquid glaze coatings the instructions shall also include surface preparation requirements and the number and types of coats required for each surface. Detailed application instructions shall be furnished for textured coatings.

5. QUALITY ASSURANCE PROVISIONS. Approval of materials will be based on test reports furnished except that where samples are tested the approval will be based on tests of samples. If materials are approved based on test reports furnished, samples will be retained by the Government for testing should the materials appear defective during or after application. In addition to any other remedies under the contract, the actual cost of retesting materials found to be defective will be deducted from payments due the Contractor.

6. COLORS AND TINTS shall conform to Fed. Std. 595. The color of the undercoats shall vary slightly from the color of the next coat. Stains shall conform in shade to manufacturer's standard color. Colors shall be as listed in SECTION: DECORATING SCHEDULE.

7. ENVIRONMENTAL CONDITIONS. Water-thinned coatings will be applied only when the ambient temperature is between 50 and 90°F. Liquid glaze coatings will be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Coatings shall be applied only when the ambient temperature is between 45 and 95°F, unless otherwise recommended by the coating manufacturer. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch. In no case shall paint be applied to surfaces upon which there is visible frost or ice.

8. MATERIALS.

8.1 GENERAL. Materials shall conform to the requirements of the specifications listed herein and in the PAINTING SCHEDULE except when the required quantity of a material of a particular color is 25 gallons or less, an approved proprietary brand of materials similar in intended usage and color to that specified may be used.

8.2 CEMENT-EMULSION FILL COAT shall be either an acrylic-based fill coat or a polyvinyl acetate fill coat and shall consist of the following:

White portland cement	16.5 pounds
Aggregate	33.5 pounds
Mixing liquid	0.75 gallon
Potable water	1.0 gallon maximum

Exterior Emulsion Paint 1.0 gallon.

The white portland cement shall conform to ASTM C 150, Type I. The aggregate shall be washed silica sand with the following gradation:

<u>U.S. Sieve Size</u>	<u>Percent Sand (by weight) Passing Individual Sieve</u>
20	100
30	95-100
50	30-65
100	0-10
200	0-1

The mixing liquid shall be the same resin emulsion as used in formulating the exterior emulsion paint. The acrylic mixing liquid shall contain 46-47% solids. The polyvinyl acetate mixing liquid shall consist of 92.6% by weight of vinyl polymer (55% solids), 3.7% by weight carbitol acetate, and 3.7% by weight potable water. The mixing liquid shall be factory prepared. The exterior emulsion paint shall be exterior acrylic emulsion paint conforming to Fed. Spec. TT-P-19 or exterior polyvinyl acetate emulsion paint conforming to Fed. Spec. TT-P-55, Type II. The various cement-emulsion fill coats and exterior emulsion paints shall not be interchanged.

8.3 EXTERIOR OIL PAINT shall conform to the following Fed. Specs. or Mil. Specs.

White: TT-P-102 or MIL-P-52324, Class (1)(2).
Light Tints: TT-P-102 or MIL-P-52324, Class 2.
Red or Brown: TT-P-31.
Other Deep Colors: TT-P-37.

8.4 FERROUS-METAL PRIMER shall conform to Fed. Spec. TT-P-86, Type I or II; TT-P-615, Type I, II, or V; or TT-P-645.

8.5 LIQUID GLAZE COATING shall conform to Fed. Spec. TT-C-550, Class B, Semigloss.

9. SURFACE PREPARATION.

9.1 GENERAL. Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Exposed ferrous metals including nails on or in contact with surfaces to be painted with water-thinned paints shall be spot-primed with zinc dust, zinc dust-zinc oxide, zinc yellow-iron oxide, or zinc chromate primer. Surfaces to be painted shall be clean before applying paint or surface treatments. Oil and great shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100°F.

Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.

9.2 MASONRY SURFACES shall be allowed to dry at least 30 days before painting. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. - Immediately before coating with cement-emulsion filler, concrete-masonry-unit surfaces shall be uniformly and thoroughly damped by several applications of potable water with a fog spray, allowing time between the sprayings for the water to be absorbed. There shall be no free surface water visible when the coating is applied.

9.3 FERROUS SURFACES that have not been shop-coated shall be solvent-cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be mechanically cleaned by power wire brushing or sandblasting. Minor amounts of residual rust that cannot be removed except by thorough blast cleaning, and tight mill scale that cannot be removed by applying a sharp knife to any edge, will be allowed to remain. After cleaning, one coat of ferrous-metal primer shall be applied to all ferrous surfaces to receive paint other than asphalt varnish and vinyl paint. The semi-transparent film applied to some pipes and tubing at the mill is not to be considered as a shop coat, but shall be overcoated with the specified ferrous metal primer prior to application of finish coats. Shop coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

9.4 GALVANIZED AND NON-FERROUS SURFACES. Galvanized, aluminum and aluminum alloy, lead, copper and other non-ferrous surfaces to be painted shall be solvent-cleaned and treated with vinyl-type wash coat.

9.5 GYPSUM BOARD SURFACES shall be dry and shall have all loose dirt and dust removed by brushing with a soft brush or rubbing with a dry cloth prior to application of the first coat material.

9.6 WOOD SURFACES.

9.6.1 General. Wood surfaces to be painted shall be cleaned of foreign matter. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up prior to the application of water-thinned paints. Small, dry, seasoned knots shall be scraped, cleaned, and given a thin coat of knot sealer, Mil. Spec. MIL-S-12935, before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, removed with mineral spirits or turpentine and the resinous area thinly coated with knot sealer. Surfaces shall be checked to ensure that finishing nails have been properly set and all holes and surface imperfections shall be primed. After priming, all holes and imperfections in finish surfaces shall be filled with putty or plastic filler, and sandpapered smooth. Putty or wood filler used shall be compatible with subsequent coatings. Painting shall proceed when the moisture content of the

wood does not exceed 12% as measured by a moisture meter, unless otherwise authorized.

10. MIXING AND THINNING.

10.1 GENERAL. When necessary to suit conditions of surface, temperature, weather, and method of application, packaged paint other than cement-emulsion filler may be thinned immediately prior to application with not more than one pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding. Paints of different manufacturers shall not be mixed.

10.2 CEMENT-EMULSION FILL COAT. Cement and aggregate shall be dry mixed so that uniform distribution and intermixing are obtained. Mixing liquid and one-half of the total amount of water shall be premixed and added gradually to the white portland cement and aggregate with constant stirring until a thick, smooth material is obtained. Emulsion paint shall then be added to the foregoing and stirred until uniformity is obtained. The blend shall have a thick, creamy consistency. The remainder of the water shall be added, if necessary, to obtain a material with adequate application characteristics. Blending resin emulsion or emulsion paint with any other component shall be done with caution; too rapid agitation will cause air entrapment and foaming.

11. APPLICATION.

11.1 GENERAL. Paint may be applied by brush, roller or spray except as hereinafter specified. At time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Paint shall be applied so finish surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Each coat shall be applied as a film of uniform thickness. Special attention shall be given to ensure that all surfaces including edges, corners, crevices, welds, and rivets receive a full thickness equivalent to that of adjacent painted surfaces. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Adequate ventilation shall be provided during paint application. Respirators shall be worn by all persons engaged in spray painting. Adjacent areas shall be protected by the use of drop cloths or other approved precautionary measures shall be taken. The first coat on gypsum wallboard and other surfaces shall include repeated touching up on suction spots or overall applications or primer or sealer to produce a uniform color and gloss. Steel sashes shall be given both coats of paint within three weeks of the time they are glazed, but not before the glazing material has set; paint shall overlay glass slightly above the sight line.

11.2 TIME BETWEEN SURFACE PREPARATION AND PAINTING. Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first-coat as soon as practicable after such pretreatment has been completed, but prior to any deterioration of the prepared surface.

11.3 COATING PROGRESS. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit adverse weather conditions. Oil base or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

11.4 LIQUID GLAZE COATINGS. Manufacturer's instructions for application, curing and drying time between coats will be followed. The total coating system thickness for liquid glaze coatings, including a top or glaze coat thickness of 3 mils, shall be not less than 8 mils.

11.5 MASONRY SURFACES may be coated by brush, roller, or spray, except filler coats. Cement-emulsion filler shall be vigorously scrubbed into the surface with a stiff-bristle brush having tampico or palmyra bristles not longer than 2-1/2 inches. At least 24 hours shall elapse before applying exterior emulsion paint over cement-emulsion filler coat. When the ambient temperature is in excess of 85°F, cement-emulsion filler surfaces shall be lightly dampened with as fog spray of potable water immediately prior to application of the subsequent paint coat. Application of solvent-thinned filler shall be to completely dry surfaces. Solvent-thinned filler shall be scrubbed in using a brush with short, stiff bristles, allowed to set for 3-5 minutes or until the filler becomes tacky, and the excess filler material removed with a rubber squeegee. Surface voids shall be filled. Surface irregularities need not be completely filled. The material shall not be applied over calking compound.

11.6 METAL SURFACES. First coats other than vinyl paints or vinyl-type wash coats shall be applied by brush. The three coat paint systems specified for exterior and interior ferrous surfaces shall be applied so that the dry film thickness of the three coat systems at any point shall be not less than 4.0 mils with the primer having a minimum dry film thickness of 1.5 mils.

12. SURFACES TO BE PAINTED. Surfaces listed in the PAINTING SCHEDULE, other than those listed in paragraphs: SURFACES NOT REQUIRING PAINTING and SURFACES FOR WHICH PAINTING IS PROHIBITED, will receive the surface preparation, paints, and number of coats prescribed in the schedule.

13. SURFACES NOT REQUIRING PAINTING. The following listed items will not require painting:

Interior Liner Panel to Vertical Siding.
All Concrete Surfaces.

14. SURFACES FOR WHICH PAINTING IS PROHIBITED. The following listed items shall not be painted:

Equipment Nameplates.
Instrumentation Items.
Machined Surfaces.

15. CLEANING. Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits upon adjacent surfaces shall be removed and the entire job left clean and acceptable.

16. USE OF PAINTING SCHEDULE. The PAINTING SCHEDULE prescribes the surfaces to be painted, required surface preparation, and the number and types of coats of paint. Explanatory information for use with the PAINTING SCHEDULE is as follows.

16.1 CONTRACTOR'S OPTIONS. The PAINTING SCHEDULE provides two types of Contractor's options as shown in the following examples:

	<u>Surface</u>	<u>1st Coat</u>	<u>2nd Coat</u>	<u>3rd Coat</u>
(1)	Exterior wood surfaces not otherwise specified.	TT-P-1984.	TT-P-9. or TT-P-1510.	TT-P-19. TT-P-1510.
(2)	Interior hardboard surfaces.	TT-E-543 or TT-E-545.	TT-E-508 or TT-E-509.	

Explanation: In the first example, the Contractor must use TT-P-1984 for the first coat. The Contractor has the option of using TT-P-19 or TT-P-1510 for the second and third coats. The Contractor shall not mix this option by using TT-P-19 for one coat and TT-P-1510 for the other coat. In the second example, the Contractor has the option of using either TT-E-543 or TT-E-545 for the first coat, and either TT-E-508 or TT-E-509 for the second coat, in any of the four possible combinations.

16.2 SURFACE PREPARATION. That statement "as previously specified" under column heading "Surface Preparation" of the PAINTING

SCHEDULE refers to paragraph: SURFACE PREPARATION of this section of the specification.

16.3 SHOP-PAINTED ITEMS. Surfaces of items finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specifications, are exempted from the requirements for surface preparation and painting. Shop-primed items shall receive surface preparation and finish painting as required by this section.

17. PAINTING SCHEDULE.

Surface	Surface Preparation	1st Coat	2nd Coat	3rd Coat	4th Coat
17.1	EXTERIOR SURFACES subject to normal atmospheric exposure, including all surfaces not completely enclosed.				
Ferrous surfaces, exposed, unless otherwise specified.	As previously specified.	Exterior oil paint.	Exterior oil paint.	None.	None.
		TT-P-38,	TT-P-38	None.	None.
		TT-E-489, Class A.	TT-E-489, Class A.	None.	None.
		or			
		TT-E-1593.	TT-E-1593.		

17.2	INTERIOR SURFACES exposed to view within rooms, corridors, stairwells, and closets, except specialized areas otherwise specified in subsequent paragraphs.				
Concrete masonry units, concrete (except concrete floors and textured ceilings), gypsum board.	As previously specified.	TT-P-29.	*TT-P-29.	None.	
		TT-P-29.	TT-P-30.	None.	
		TT-P-29.	TT-E-543 or TT-E-545.	TT-E-508 or TT-E-509.	
		TT-p-29.	TT-E-543 or TT-E-545.	TT-P-1511, Type I.	

*TT-P-1728 for deep tones.

Wood surfaces (except floors), unless otherwise specified.	As previously specified.	TT-E-543 or TT-E-545.	TT-P-30.	None.	
		TT-E-543 or TT-E-545.	TT-E-508 or TT-E-509.	None.	
		TT-E-543 or TT-E-545.	TT-E-1511 Type I.	None.	
		TT-E-543 or TT-E-545.	TT-E-1511	None.	
		TT-E-545.	TT-E-506.		

<u>Surface</u>	<u>Surface Preparation</u>	<u>1st Coat</u>	<u>2nd Coat</u>	<u>3rd Coat</u>	<u>4th Coat</u>
Exposed ferrous surfaces (unless otherwise specified), and interior under-side of zinc-coated and shop-primed steel roof decking where exposed in areas having painted walls.	As previously specified.	TT-P-30. TT-E-543 or TT-E-545. TT-E-543 or TT-E-544. TT-P-38.	TT-P-30. TT-E-508 or TT-E-509. TT-E-505 or TT-E-506. TT-P-38.	None. None. None. None. None.	

Wood and metal trim, doors, and windows (except natural-finished wood surfaces).	As previously specified for each type surface.	TT-E-543 or TT-E-545.	TT-E-508 or TT-E-509.	None.	
--	--	--------------------------	--------------------------	-------	--

17.3 INTERIOR SURFACES IN WET OR SANITARY AREAS (Rooms designated as toilet areas).

Concrete-masonry-unit walls, unless otherwise specified.	As previously specified.	TT-F-1098 TT-F-1098	TT-P-29 or TT-S-179. TT-P-95, Type II, Class 3.	TT-E-543 or TT-E-545. TT-P-95, Type II, Class 1.	TT-E-505 or TT-E-506. None.
Walls and ceilings (except ferrous surfaces and concrete masonry units), unless otherwise specified.	As previously specified.	TT-P-29 or TT-S-179 or TT-P-650, Type I. TT-P-95, Type II, Class 3.	TT-E-543 or TT-E-545. TT-P-95, Type II, Class 1.	TT-E-505 or TT-E-506. None.	None.

ZERO ACCIDENTS
SECTION 10A
TOILET ACCESSORIES

INDEX

- | | |
|----------------------------|--------------------|
| 1. Applicable Publications | 5. Finishes |
| 2. General | 6. Accessory Items |
| 3. Submittals | 7. Installation |
| 4. Anchors and Fasteners | |

1. APPLICABLE PUBLICATIONS. The following specifications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.).

DD-M-00411b Mirrors, Glass.
 (GSA-FSS)
 & Am-1

WW-P-541/8A Plumbing Fixtures (Accessories, Land Use)
 (GSA-FSS) (Detail Specification).
 & Am-1

2. GENERAL. Toilet accessories as specified herein shall be provided. Each accessory item shall be complete with the necessary mounting plates, anchors, and fasteners. Concealed mounting plates shall be of sturdy construction with corrosion-resistant surface.

3. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit for approval, data as specified herein on the following.

3.1 CATEGORY I. None.

3.2 CATEGORY II. One sample of each accessory proposed for use shall be submitted for approval. Samples shall be accompanied by descriptive data indicating materials of construction, fasteners proposed for use for each type of wall construction, recommended mounting locations, and mounting instructions. Approved samples may be incorporated into the finished work provided they are identified and their locations noted.

4. ANCHORS AND FASTENERS shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory.

5. FINISHES. Finishes on metals shall be provided as follows:

<u>Metal</u>	<u>Finishes</u>
Stainless Steel	No. 4 General-Purpose Polished.
Aluminum	Satin Anodic, Clear.
Carbon Steel, Copper Alloy, and Brass	Chromium Plated, Bright.

6. ACCESSORY ITEMS shall conform to the respective specifications and other requirement specified below.

6.1 MIRROR, GLASS (MG). Fed. Spec. DD-M-411, Class 2. Size shall be 18 inches by 30 inches.

6.2 PAPER TOWEL DISPENSER (PTD). Fed. Spec. WW-P-541, Type I, Class 3.

6.2.1 Mounting S, Surface.

6.2.1.1 Style N (Folded Towels). Dispenser shall not be less than 22-gage carbon steel. Dispensers shall be sized for multi-fold towels.

6.3 SOAP DISPENSER (SD). Liquid type consisting of a vertical stainless steel tank with holding capacity of 40 fluid ounces.

6.4 TOILET TISSUE DISPENSER (TTD). Fed. Spec. WW-P-541, Type I, Class 1, Style K, copper alloy.

6.5 WASTE RECEPTACLE (WR). Fed. Spec. WW-P-541, Type II, stainless steel, designed for surface mounting. Reusable liner of the type standard with the receptacle manufacturer shall be provided. Capacity shall be not less than 3/4 cubic feet.

6.6 TOILET EXHAUST FAN. Direct drive centrifugal wall exhaust installed on exterior wall with weatherproof enclosure. Include backdraft dampers. Motor shall not exceed 1/12 HP, 110V/1/60. Minimum capacity shall be 80 CFM at 1/4" S.P.

7. INSTALLATION. Toilet accessories shall be securely fastened to the supporting construction in accordance with the approved submittals. Accessories shall be protected from damage from the time of installation until acceptance.

ZERO ACCIDENTS
SECTION 11A
CARBON ADSORPTION
WATER TREATMENT SYSTEM

INDEX

- | | |
|-----------------------|----------------------------|
| 1. Item Description | 5. Characteristics |
| 2. Submittals | 6. Design and Construction |
| 3. Materials | 7. Installation |
| 4. Service Conditions | 8. Tests |

1. Item Description. This section covers requirements for furnishing and installing a water treatment system designed to remove organic contaminants from groundwater. The system shall consist of three parallel carbon adsorption systems, each capable of continuously processing 500 gpm of contaminated groundwater.

2. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

2.1 CATEGORY I

Outline drawings and dimension prints

Performance data and calculations

Parts Lists

Installation Instructions

Operating and Maintenance Instructions

2.1 CATEGORY II (none required)

3. MATERIALS. All materials used in the water treatment system covered hereunder shall be the manufacturer's standard items, suitable for the service, as specified.

4. SERVICE CONDITIONS

4.1 ENVIRONMENTAL

A. Ambient
Temperatures:

A. 40°F - 102°F

B. Influent
Temperatures:

B. Approximately 50°F

C. Plant Elevation C. 5,280 ft.

4.2 INFLUENT ANALYSIS

A. Type of Influent: A. Groundwater

B. Pollutant to be removed: B. Dibromochloropropane (DBCP), max.concentration level of 1.0 micrograms per liter (1.0 ug/l).

C. Total Organic Carbon: C. 10.0 micrograms per liter (10.0 ug/l), max. concentration level.

5. CHARACTERISTICS

5.1 GENERAL EQUIPMENT CHARACTERISTICS

A. Equipment Type: A. Three (3) identical units, operated in parallel trains: Each unit a high efficiency, pulsed bed, countercurrent, granular activated carbon adsorption type....with multiple stages as required to enable the maximum influent-to-carbon contact durations, suitable for the service.

B. Type of Operation: B. Continuous, unsupervised treatment operation; monitoring and control functions manually initiated.

Periodic spent carbon replacement process not to cause operation shutdown.

C. Influent Flow Rate: C. 500 USGPM through each unit in parallel (1,500 gpm total through all three)

D. Influent Pressure: D. 70 psig

E. Hydraulic Loading: E. Not to exceed 8 gpm/sq. ft. for the carbon contactor.

F. Residence Time: F. Influent-to-carbon contact durations shall be 15 minutes (minimum).

- | | |
|----------------------------------|---|
| G. Allowable Effluent Pollutant: | G. Per Colorado Dept. of Health Standards: max. concentration of dibromochloropropane (DBCP) pollutant in effluent not to exceed 0.2 micrograms per liter (0.2 ug/l). |
| H. Effluent Sampling: | H. Conveniently located transverse watersampling devices shall be provided for manual sampling of influent and effluent at every stage. |
| I. Controls and Indications: | I. All controls, valves and indicators needed for manual operation of the units shall be manufacturer's standard, furnished with the units. |
| J. Equipment Configuration: | J. Equipment shall be modularized, package type or skid mounted to the max. practicable extent outlined on P&ID drawing. |
| K. Piping and Accessories: | K. All piping and accessories needed to render the treatment system fully operable shall be furnished with the units. |
- Unit's pipe systems shall be complete with all components shown within outlined areas on P&ID drawings factory assembled to the max. practicable extent, ready for connection to Government interfaces.

5.2 CARBON EXCHANGE SYSTEM CHARACTERISTICS

- | | |
|-------------------------|---|
| A. Type of System: | A. Carbon exchange system shall be a manually controlled, compressed air operated, slurry transfer type....for removing spent carbon from bottom of adsorption column, replacing with corresponding amounts of fresh carbon at top of column. |
| B. Fresh Carbon Supply: | B. In addition to adsorption columns, units shall have storage capability for at least 30,000 lbs. (dry weight) of fresh carbon....replenishable from bulk transport trucks. |

- | | |
|------------------------------|--|
| C. Spent Carbon Storage: | C. In addition to adsorption columns, units shall have storage capability for at least 20,000 lbs. (dry weight) of fresh spent carbon.... unloadable into bulk transport trucks. |
| D. Carbon Transport System: | D. In addition to adsorption columns, dual blowcases, one each for spent and fresh carbon pressurized transfer shall be provided....fresh carbon from storage to each adsorber. Spent carbon from each adsorber to spent carbon storage. |
| E. Granuler Activated Carbon | E. Initial inventory of 12 X 40 mesh virgin granular - activated carbon. |
| F. Piping: | F. Polypropylene-lined steel pipe, valves and fittings, where required. |

6. DESIGN AND CONSTRUCTION

6.1 ACCESSIBILITY. Water treatment units shall be designed and constructed with manholes, handholes, viewing ports as necessary to provide ready access to all parts for operation, cleaning and maintenance.

6.2 PRESSURE VESSELS. All pressure vessels shall be fabricated and stamped in accordance with applicable ASME requirements.

6.3 NAMEPLATES. Each pertinent item of equipment shall have a rust resistant metal nameplate with all pertinent information clearly inscribed thereon. Each nameplate shall be permanently attached in a conspicuous place on its piece of equipment.

6.4 FINISHING AND PAINTING

- A. Cleaning and Closures. All internal and external surfaces of equipment shall be cleaned of all mill scale, loose metal particles, weld spatter, slag, dirt, grease, oil and other foreign matter. All burrs and flashing shall be removed and all sharp edges shall be eased. Following cleaning, all openings shall be sealed against entry of paint, water, dirt and debris during painting, shipment and field handling.

- B. External Painting. All exposed external ferrous surfaces of the equipment, excluding name and data plates, tags and machined mating surfaces, shall be given one (1) shop coat each of manufacturer's standard rust inhibitive primer and standard finish paint that are compatible with the maximum operating conditions that will be encountered.

Nameplates, data plates, tags and machined mating surfaces shall be coated with a slushing compound.

- C. Internal Lining. All water treatment vessels shall be internally lined with a 40 mil coating of spray-applied, abrasion resistant, vinyl ester resin acceptable for potable water requirements, unless otherwise approved by the Contracting Officer.

- D. Paint Color. Paint color shall be the manufacturer's standard color.

7. INSTALLATION

7.1 EQUIPMENT LOCATIONS. Units shall be mounted in the locations and manner shown on the drawings.

7.2 LEVELING AND ALIGNMENT. Units shall be leveled to the maximum practical extent, with shimming and grouting as necessary.

8. TESTS

8.1 FACTORY TESTS. Units furnished hereunder shall be subjected to the manufacturer's standard factory-level inspections and tests to assure proper construction and compliance with the requirements of this specification.

8.2 ON-SITE TESTS. After installation on-site, the Contractor shall operate each unit to verify proper installation and compliance with the requirements of this specification.

ZERO ACCIDENTS
SECTION 11B
PUMPS: WATER, VERTICAL SUMP

INDEX

- | | |
|-----------------------|----------------------------|
| 1. Item Description | 5. Characteristics |
| 2. Submittals | 6. Design and Construction |
| 3. Materials | 7. Installation |
| 4. Service Conditions | 8. Tests |

1. ITEM DESCRIPTION. This section covers requirements for furnishing and installing four (4) vertical, water sump pumps. Three pumps shall be automatic, level switch controlled; one pump shall be spare, manually operated, but with automatic low-level shutdown switch. Each pump shall have base mounting plate, above-floor discharge and direct-coupled electric motor driver.

2. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

2.1 CATEGORY I

Outline drawings and dimension prints
Permissible forces and moments on nozzles data
Performance Curves
Parts Lists
Installation Instructions
Operating and Maintenance Instructions

2.2 CATEGORY II

Test results

3. MATERIALS. All materials used in the pumps covered hereunder shall be the manufacturer's standard items, suitable for the service, as specified.

4. SERVICE CONDITIONS

4.1 ENVIRONMENTAL

- | | |
|------------------------------------|-----------------------|
| A. Indoor Ambient
Temperatures: | A. 40°F - 102°F |
| B. Pumped Water
Temperatures: | B. Approximately 50°F |

C. Plant Elevation

C. 5,280 FT.

4.2 OPERATIONAL

A. Type of Operation:

A. Pumps will operate in a concrete sump pit, with the motor driver mounted at floor level above the pit.

B. Mounting Location:

B. Both sump and pump to be operated inside heated, weather proof enclosure.

C. Sump Depth:

C. 12'-6" below 9" thick concrete, pump-mounting floor.

E. Sump Water level (min.):

E. 2'-0" above sump floor

F. Sump Water Level (max.):

F. 10'-0" above sump floor

5. CHARACTERISTICS

5.1 GENERAL PUMP CHARACTERISTICS

A. Pump Type:

A. Heavy duty, industrial grade, vertical shaft, centrifugal sump type. Supported from its motor mounting base by means of a column pipe of specified length.

B. Fluid Pumped:

B. Contaminated Ground Water

C. Flow, Design

C. 500 USGPM

D. Design Temperature

D. Contaminated groundwater at ambient temperatures (approximately 50°F)

E. Discharge Pressure,
Design

E. 70 psig.*

F. Required Total Developed
Head, Design

F. 160 ft.*

* Actual pressure criteria will be dependent on actual process equipment provided.

G. Pump Length (base of
suppt. plates to
bottom intake strainer)

G. To match sump depth.

5.2 PUMP DETAIL CHARACTERISTICS

- | | |
|----------------------------|---|
| A. Casing and Column Pipe: | A. Casing shall be bottom suction, with strainer, volute type, rigidly secured to column pipe. Column pipe ends shall be machined for maximum vertical alignment. |
| B. Shaft: | B. Shafts shall be of steel, large enough to prevent whipping and to withstand stresses of full voltage motor starts. |
| C. Impellers: | C. Impeller shall be statically balanced, finished smooth, and securely fixed to the shaft in such a way that it may be readily dismantled. |
| D. Bearings: | D. Bearings shall be renewable sleeve type with ample wearing surfaces. Bottom bearing shall be as close to the impeller as design will permit. |
| E. Bearing Housing: | E. Sealed against moisture and dirt, but providing access to bearing for removal and maintenance. |
| F. Lubrication: | F. Grease lubricated, unless otherwise approved. |
| G. Base Support Plates: | G. Steel, size and shape manufacturers standard. |
| H. Discharge Pipe: | H. Elbowed out from pump casing, terminated above mounting plate with an ANSI Class 150 flat face flange. |

I. Pump Operation:

I. Three of the pumps, P-101, P-102 and P-103, shall operate automatically, controlled by liquid level float switches provided with each.

The 4th pump, P-104, shall be a spare and shall be manually operated only. This 4th pump shall have provisions for automatic low liquid level cutoff.

Pumps and drivers shall be capable of continuous operation under all conditions of service.

J. Control Settings
(Automatic Pumps P-101, P-102 and P-103):

- (1) P-101 "ON"
- (2) P-101 "OFF"
- (3) P-102 "ON"
- (4) P-102 "OFF"
- (5) P-103 "ON"
- (6) P-103 "OFF"

- (1) 8' above sump floor
- (2) 2' above sump floor
- (3) 9' above sump floor
- (4) 3' above sump floor
- (5) 10' above sump floor
- (6) 4' above sump floor

5.3 PUMP DRIVER CHARACTERISTICS

A. Type:

A. Pump driver shall be an electric motor, conforming to all requirements of PARAGRAPH: MOTORS IN SECTION: ELECTRICAL WORK, INTERIOR....suitable for the service conditions specified herein.

B. Power Rating (HP):

B. Drive motor shall be rated at 40 HP.

C. Operating Voltage:

C. Drive motor shall operate on 480 VAC, 3-phase, 3-wire power.

5.4 COUPLING CHARACTERISTICS

A. Type:

A. Pump and motor shall be direct connected by means of a flexible coupling to form a single, self-contained unit which can be readily lifted from the sump pit.

B. Type:

B. Couplings shall be flanged, sized and designed for the full driver rating and maximum pump downthrust.

Coupling halves shall be factory-fitted and keyed to its shaft.

6. DESIGN AND CONSTRUCTION

6.1 GENERAL. Pump parts shall be constructed of durable metal (steel, iron, bronze, etc.) unless approved otherwise by the Contracting Officer.

6.2 ACCESSIBILITY. Pumps and drives shall be designed and constructed in such a manner as to permit ready access to all parts for inspection, adjustment and repairs.

6.3 NAMEPLATES. Each pump and its driver shall have a rust resistant metal nameplate with all pertinent information clearly inscribed thereon. Each nameplate shall be permanently attached in a conspicuous place on its piece of equipment.

6.4 FINISHING AND PAINTING

A. Cleaning and Closures. All internal and external surfaces of equipment shall be cleaned of all mill scale, loose metal particles, weld spatter, slag, dirt, grease, oil and other foreign matter. All burrs and flashing shall be removed and all sharp edges shall be eased. Following cleaning, all openings shall be sealed against entry of paint, water, dirt and debris during painting, shipment and field handling.

B. Painting. All exposed ferrous surfaces of the equipment, excluding name and data plates, tags and machined mating surfaces, shall be given one (1) shop coat each of equipment manufacturer's standard rust inhibitive primer and standard finish paint that are compatible with the maximum operating conditions that will be encountered.

Nameplates, data plates, tags and machined mating surfaces shall be coated with a slushing compound.

- C. Paint Color. Paint color shall be manufacturer's standard color.

7. INSTALLATION

7.1 Equipment Locations. Pumps shall be mounted to the concrete floor above the sump in the locations shown on the drawings.

7.2 Leveling and Alignment. Pumps shall be leveled, with shimming as necessary, to assure as nearly perfect vertical alignment of rotating parts as is practicable.

8. TESTS

8.1 Factory Tests. Each pump and driver furnished hereunder shall be subjected to the manufacturer's standard inspections and tests to assure proper construction and compliance with the requirements of this specification.

8.2 On-Site Tests. After installation on-site, the Contractor shall operate each pump to verify proper installation and compliance with the requirements of this specification.

ZERO ACCIDENTS
SECTION 11C
AIR COMPRESSOR UNIT

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- | | |
|---------------------|-----------------|
| 1. Item Description | 6. Design and |
| 2. Submittals | Construction |
| 3. Materials | 7. Installation |
| 4. Service | 8. Tests |
| 5. Characteristics | |

1. ITEM DESCRIPTION. This section covers requirements for furnishing and installing the air compressor unit which will supply air to operate an interfacing carbon slurry transfer system and backwashable filters, described elsewhere in these specifications.

2. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

2.1 CATEGORY I

Outline Drawings and Dimension Prints

Performance Data and Calculations

Parts Lists

Installation Instructions

Operating and Maintenance Instructions

2.1 CATEGORY II (none required)

3. MATERIALS. All materials used in the compressed air system covered hereunder shall be the manufacturer's standard items, suitable for the service, as specified.

4. SERVICE CONDITIONS

4.1 ENVIRONMENTAL

A. Indoor Ambient A. 40°F - 102°F
Temperatures:

B. Plant Elevation: B. 5,280 Ft.

5. CHARACTERISTICS

5.1 GENERAL COMPRESSOR CHARACTERISTICS

- | | |
|---------------------------------|--|
| A. Equipment Type: | A. Single stage, air-cooled compressor; receiver mounted, electric motor driven through belt coupling, skid-mounted or package type. |
| B. Receiver Capacity: | B. 120 gal. |
| C. Actual Free Air Delivery: | C. 25 SCFM |
| D. Discharge Pressure Rating: | D. 80 psig |
| E. Controls and Monitors: | E. All controls, valves and indicators needed for safe operation of the unit shall be manufacturer's standard, furnished with the unit. |
| F. Piping, fittings and valves: | F. All piping, fittings and valves needed to render the unit fully operable shall be furnished with the unit....factory assembled to the maximum practicable extent. |
| G. Accessories: | G. The unit shall have the following accessories:

(1) Air inlet filter-silencer

(2) Automatic condensate drain valve (to eliminate need for manual draining)

(3) Low oil level switch |

5.2 DRIVER CHARACTERISTICS

- | | |
|----------|---|
| A. Type: | A. Compressor driver shall be an electric motor, conforming to all requirements of PARAGRAPH: MOTORS in SECTION: ELECTRICAL WORK, INTERIOR....suitable for operation under the conditions specified herein. |
|----------|---|

- | | |
|-----------------------|---|
| B. Operating Voltage: | B. Motor shall operate on 480 VAC, 3-phase, 3-wire power. |
| C. Power Rating: | C. Motor power shall be rated to meet the flow and discharge pressure requirements specified. |

5.3 COUPLING CHARACTERISTICS

- | | |
|------------|--|
| A. Type: | A. Motor shall be drive-belt coupled to operate the compressor. |
| B. Guards: | B. Coupling shall be equipped with guards as needed to prevent exposure to moving parts. |

6. DESIGN AND CONSTRUCTION

6.1 ACCESSIBILITY. Units furnished hereunder shall be designed and constructed in such a manner as to permit ready access to all parts for inspection, adjustment and repairs.

6.2 NAMEPLATES. Units furnished shall each have a rust resistant metal nameplate with all pertinent information clearly inscribed thereon. Each nameplate shall be permanently attached in a conspicuous place on its piece of equipment.

6.3 FINISHING AND PAINTING

A. Cleaning and Closures. All internal and external surfaces of equipment shall be cleaned of all mill scale, loose metal particles, weld spatter, slag, dirt, grease, oil and other foreign matter. All burrs and flashing shall be removed and all sharp edges shall be eased. Following cleaning, all openings shall be sealed against entry of paint, water, dirt and debris during painting, shipment and field handling.

B. Painting. All exposed ferrous surfaces of the equipment, excluding name and data plates, tags and Machined mating surfaces, shall be given one (1) shop coat each of equipment manufacturer's standard rust inhibitive primer and standard finish paint that are compatible with the maximum operating conditions that will be encountered.

Nameplates, data plates, tags and machined mating surfaces shall be coated with a slushing compound.

C. Paint Color. Paint color shall be manufacturer's standard color.

7. INSTALLATION

7.1 EQUIPMENT LOCATIONS. Units shall be mounted in the locations shown on the drawings.

7.2 LEVELING AND ALIGNMENT. Units shall be leveled to the max. practicle extent, with shimming and grouting as necessary.

8. TESTS

8.1 FACTORY TESTS. Each unit furnished hereunder shall be subjected to the manufacturer's standard factory-level inspections and tests to assure proper construction and compliance with the requirements of this specification.

8.2 ON-SITE TESTS. After installation on-site, the Contractor shall operate each unit to verify proper installation and compliance with the requirements of this specification.

ZERO ACCIDENTS
SECTION 11D
FILTERS, WATER TREATMENT SYSTEM

INDEX

- | | |
|-----------------------|----------------------------|
| 1. Item Description | 5. Characteristics |
| 2. Submittals | 6. Design and Construction |
| 3. Materials | 7. Installation |
| 4. Service Conditions | 8. Tests |

1. ITEM DESCRIPTION. This section covers requirements for furnishing and installing two types of filters for the water treatment system which is described elsewhere in these specifications:

1.1 Type I - Three (3) each in-line prefilters, one mounted in the influent line upstream of each water treatment unit.

1.2 Type II - One (1) each in-line post filter, mounted to process the effluent from all three water treatment units.

2. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

2.1 CATEGORY I

Outline Drawings and Dimension Prints

Performance Data and Calculations

Parts Lists

Installation Instructions

Operating and Maintenance Instructions

2.1 CATEGORY II (none required)

Test results

3. MATERIALS. All materials used in the filters covered hereunder shall be the manufacturer's standard items, suitable for the service, as specified.

4. SERVICE CONDITIONS

4.1 ENVIRONMENTAL

- | | |
|---------------------------------|-----------------------|
| A. Indoor Ambient Temperatures: | A. 40°F - 102°F |
| B. Influent Temperatures: | B. Approximately 50°F |
| C. Plant Elevation: | C. 5,280 Ft. |

4.2 TREATMENT SYSTEM INFLUENT ANALYSIS

- | | |
|--------------------------|--|
| A. Type of Influent: | A. Groundwater |
| B. Solids in Suspension: | B. Various mineral, clay and earth particles, typical of raw groundwater pumped from water well sumps. |

4.3 TREATMENT SYSTEM EFFLUENT ANALYSIS

- | | |
|--------------------------|---|
| A. Type of effluent | A. Treated groundwater from carbon adsorption process |
| B. Solids in suspension: | B. Entrained carbon particles |

5. CHARACTERISTICS

5.1 TYPE I (Prefilter) Characteristics:

- | | |
|--------------------|--|
| A. Filter Type: | A. Multiple element, self-cleaning, in-line type; furnished with three active elements, of sufficient size for future addition of two additional elements. |
| B. Application: | B. Continuous filtering of treatment system "influent", as specified. |
| C. Filter Element: | C. Filter element shall be polypropylene type over stainless steel frame, unless otherwise approved by the Contracting Officer. |
| D. Solids Removed | D. Prefiltering shall remove all solids in suspension over 100 microns in size. |

- | | |
|---------------------------------|--|
| E. Filter Capacity: | E. 500 gpm, each. |
| F. Inlet Pressure: | F. 70 psig. |
| G. Pressure Differential: | G. Approx. 5 psig, clean. |
| H. Backwash Capability: | H. Manually or differential pressure switch initiation with time clock for backwash cycle times; compressed air operated. |
| I. Controls and Indicators: | I. All controls and indicators needed for operation of the units shall be manufacturer's standard, furnished with the units. |
| J. Piping, Fittings and Valves: | J. All piping and accessories needed to render the prefilters fully operable shall be furnished with the units. |
| K. Equipment Configuration: | K. Package type or skid-mounted units, suitable for floor mounting |

5.2 TYPE II (POST FILTER) CHARACTERISTICS

- | | |
|---------------------|--|
| A. Filter Type: | A. Multiple element, self-cleaning, in-line type; furnished with nine active elements, of sufficient size for future addition of four additional elements. |
| B. Application: | B. Continuous filtering of treatment system "effluent", as specified. |
| C. Filter Element: | C. (Same as Type I prefilter) |
| D. Solids Removed: | D. Post filter operation shall remove all entrained carbon particles over 100 microns in size. |
| E. Filter Capacity: | E. 1500 gpm |
| F. Inlet Pressure: | F. 70 psig |
| G. Pressure | G. Approx. 5 psig, clean |

- | | |
|---------------------------------|--|
| H. Backwash Capability: | H. Manually or differential pressure switch initiation with time clock for backwash cycle times; compressed air operated. |
| I. Controls and Indicators: | I. All controls and indicators needed for operation of the unit shall be manufacturer's standard, furnished with the unit. |
| J. Piping, Fittings and Valves: | J. All piping and accessories needed to render the post filter fully operable shall be furnished with the unit. |
| K. Equipment Configuration: | K. Package type or skid-mounted unit, suitable for floor-mounting |

6. DESIGN AND CONSTRUCTION

6.1 ACCESSIBILITY. Filters shall be designed and constructed in such a manner as to permit ready access to all parts for inspection, adjustment and repairs.

6.2 NAMEPLATES. Filters shall have a rust resistant metal nameplate with all pertinent information clearly inscribed thereon. Each nameplate shall be permanently attached in a conspicuous place on its piece of equipment.

6.3 FINISHING AND PAINTING

A. Cleaning and Closures. All internal and external surfaces of equipment shall be cleaned of all mill scale, loose metal particles, weld spatter, slag, dirt, grease, oil and other foreign matter. All burrs and flashing shall be removed and all sharp edges shall be eased. Following cleaning, all openings shall be sealed against entry of paint, water, dirt and debris during painting, shipment and field handling.

B. Painting. All exposed ferrous surfaces of the equipment, excluding name and data plates, tags and machined mating surfaces, shall be given one (1) shop coat each of equipment manufacturer's standard rust inhibitive primer and standard finish paint that are compatible with the maximum operating conditions that will be encountered.

Nameplates, data plates, tags and machined mating surfaces shall be coated with a slushing compound.

- C. Paint Color. Paint color shall be manufacturer's standard color.

7. INSTALLATION

7.1 EQUIPMENT LOCATIONS. Filters shall be mounted to the concrete floor above the sump in the locations shown on the drawings.

7.2 LEAVELING AND ALIGNMENT. Filters shall be leveled, to the max. practicable extent, with shimming as necessary.

8. TESTS

8.1 FACTORY TESTS. Each filter furnished hereunder shall be subjected to the manufacturer's standard factory-level inspections and tests to assure proper construction and compliance with the requirements of this specification.

8.2 ON-SITE TESTS. After installation on-site, the Contractor shall operate each filter to verify proper installation and compliance with the requirements of this specification.

ZERO ACCIDENTS

SECTION 11E

BOOSTER PUMP

INDEX

- | | |
|-----------------------|----------------------------|
| 1. Item Description | 5. Characteristics |
| 2. Submittals | 6. Design and Construction |
| 3. Materials | 7. Installation |
| 4. Service Conditions | 8. Tests |

1. ITEM DESCRIPTION. This section covers requirements for furnishing and installing one (1) centrifugal type, water booster pump to supply water for water treatment system tanks and equipment, described elsewhere in these specifications.

2. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

2.1 CATEGORY I

Preliminary outline drawings

Permissible forces and moments on nozzles data

Performance Curves

Parts Lists

Installation Instructions

Operating and Maintenance Instructions

2.2 CATEGORY II

Test results

3. MATERIALS. All materials used in the pump covered hereunder shall be the manufacturer's standard items, suitable for the service, as specified.

4. ENVIRONMENTAL CONDITIONS

4.1 Indoor Ambient
Temperatures:

40°F - 102°F

4.2 Pumped Water
Temperatures:

Approximately 50°F

4.3 Plant Elevation

5,280 Ft.

5. CHARACTERISTICS

5.1 PUMP CHARACTERISTICS

- | | |
|-----------------------------------|--|
| A. Pump type: | A. Horizontal centrifugal type; with end suction, top discharge, flat-face flanged connections....electric motor driven. |
| B. Fluid Pumped: | B. Effluent water from carbon adsorption water treatment system. |
| C. Flow, design: | C. 175 USGPM |
| D. Discharge pressure, design: | D. 75 psig |
| E. Required total developed head: | E. 175 Ft. |
| F. Pump seals: | F. Manufacturer's standard mechanical seal. |
| G. Mounting Configuration: | G. Provided with feet or base plate for floor mounting. |

5.2 PUMP DRIVER CHARACTERISTICS

- | | |
|-----------------------|---|
| A. Type: | A. Pump driver shall be an electric motor, conforming to all requirements of PARAGRAPH: MOTORS IN SECTION: ELECTRICAL WORK, INTERIOR....suitable for the service conditions specified herein. |
| B. Power Rating (HP) | B. Drive motor shall be rated to meet the conditions of service specified. |
| C. Operating voltage: | C. Motor operating voltage shall be 480 VAC, 3-phase, 3-wire power. |
| D. Enclosure Type: | D. Totally Enclosed, Fan Cooled (TEFC) |

5.3 COUPLING CHARACTERISTICS

- A. Type: A. Pump and motor shall be close-coupled configuration.

6. DESIGN AND CONSTRUCTION

6.1 ACCESSIBILITY. Pumps and drives shall be designed and constructed in such a manner as to permit ready access to all parts for inspection, adjustment and repairs.

6.2 NAMEPLATES. Each pump and its driver shall have a rust resistant metal nameplate with all pertinent information clearly inscribed thereon. Each nameplate shall be permanently attached in a conspicuous place on its piece of equipment.

6.3 FINISHING AND PAINTING

A. Cleaning and Closures. All internal and external surfaces of equipment shall be cleaned of all mill scale, loose metal particles, weld spatter, slag, dirt, grease, oil and other foreign matter. All burrs and flashing shall be removed and all sharp edges shall be eased. Following cleaning, all openings shall be sealed against entry of paint, water, dirt and debris during painting, shipment and field handling.

B. Painting. All exposed ferrous surfaces of the equipment, excluding name and data plates, tags and machined mating surfaces, shall be given one (1) shop coat each of equipment manufacturer's standard rust inhibitive primer and standard finish paint that are compatible with the maximum operating conditions that will be encountered. ~

Nameplates, data plates, tags and machined mating surfaces shall be coated with a slushing compound.

C. Paint Color. Paint color shall be manufacturer's standard color.

7. INSTALLATION

7.1 EQUIPMENT LOCATIONS. The pump shall be mounted in the locations shown on the drawings.

7.2 LEVELING AND ALIGNMENT. Pumps shall be leveled, with shimming as necessary, to assure as nearly perfect horizontal alignment of rotating parts as is practicable.

8. TESTS

8.1 FACTORY TESTS. The pump and driver furnished hereunder shall be subjected to the manufacturer's standard factory-level inspections and tests to assure proper construction and compliance with the requirements of this specification.

8.2 ON-SITE TESTS. After installation on-site, the contractor shall operate the pump to verify proper installation and compliance with the requirements of this specification.

ZERO ACCIDENTS
SECTION 13A
METAL BUILDINGS

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- | | |
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| 1. Applicable Publications | 7. Building Components |
| 2. General | 8. Shop Painting |
| 3. Design Requirements | 9. Factory Color Finish |
| 4. Submittals | 10. Erection |
| 5. Guarantee | 11. Field Painting |
| 6. Delivery and Storage | |

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 FEDERAL SPECIFICATIONS.

- | | |
|-----------------------------------|--|
| FF-H-106a
& Am-1
& Int AM-9 | Hardware, Builders'; Locks and Door Trim. |
| FF-H-111C | Hardware, Builders'; Shelf and Miscellaneous. |
| FF-H-116E | Hinges, Hardware, Builders'. |
| FF-H-121D | Hardware, Builders'; Door Closers. |
| HH-I-558B
& Am-3 | Insulation, Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type). |
| RR-D-575B | Door, Metal, Sliding and Swinging; Door Frame, Metal (Flush and Semiflush). |

1.2 MILITARY SPECIFICATION.

- | | |
|-------------|---|
| MIL-S-4174B | Steel Sheet and Strip, Flat, Aluminum Coated, Low Carbon. |
|-------------|---|

1.3 THE ALUMINUM ASSOCIATION (ALUM. ASSOC.) PUBLICATIONS.

Aluminum Standards and Data (March 1979).

1.4 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) PUBLICATION.

Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (November 1, 1978) with Commentary.

1.5 AMERICAN IRON AND STEEL INSTITUTE (AISI) PUBLICATION.

Specification for the Design of Cold-Formed Steel Structural Members (Sept. 1980 with Errata).

1.6 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS

A 36-81a	Structural Steel.
A 53-81a	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
A 446-76	Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
A 500-81a	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
A 501-81	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
A 529-75	Structural Steel with 42,000 psi (290 MPa) Minimum Yield Point (1/2 in. [12.7 mm] Maximum Thickness).
A 570-79	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
A 572-81a	High-Strength Low-Alloy Columbium-Vandium Steels of Structural Quality.
A 606-75 (1981)	Steel Sheet and Strip, Hot-Rolled and Cold-Rolled, High-Strength, Low-Alloy, with Improved Corrosion Resistance.
A 607-75 (1981)	Steel Sheet and Strip, Hot-Rolled and Cold-Rolled, High-Strength, Low-Alloy Columbium and/or Vanadium.
A 618-81	Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing.

- B 209-82 Aluminum and Aluminum-Alloy Sheet and Plate.
- E 84-81a Surface Burning Characteristics of Building Materials.
- E 96-80 Water Vapor Transmission of Materials.

1.7 AMERICAN SOCIETY OF HEATING, REFRIGERATING AND
AIR-CONDITIONING ENGINEERS, INC. (ASHRAE) PUBLICATION.

Handbook, Fundamentals (1981).

1.8 AMERICAN WELDING SOCIETY (AWS) PUBLICATION.

D1.1-82 Structural Welding Code - Steel.

1.9 METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA) PUBLICATION.

Recommended Design Practices Manual (1981 and Errata).

1.10 STEEL WINDOW INSTITUTE (SWI) PUBLICATION.

Recommended Specifications for Steel Windows (1977).

2. GENERAL. The metal building shall be the product of an established metal building manufacturer and shall have vertical walls and gable, sloped roof with the following type of framing: Rigid Frame.

Building dimensions shall be as standard with the manufacturer and not less than those indicated, but exceeding the indicated dimensions only by the amount of the closest standard size thereto. Roof slope shall be 1-inch in 12-inches or steeper. Under ordinary weather conditions, the completed building shall be free of wind induced vibrations.

3. DESIGN REQUIREMENTS.

3.1 DESIGN LOADS shall be applied in accordance with MBMA publication, Recommended Design Practices Manual. Design loads shall be as follows:

Dead Load	20 psf.
Vertical Live Load	30 pounds per square foot.
Maximum Wind Velocity	80 miles per hour.

3.2 FOUNDATIONS. Exterior wall foundations as shown may be altered to suit the building fabricator's requirements subject to approval.

3.3 FRAMING AND STRUCTURAL MEMBERS shall be designed in accordance with the following publications.

3.3.1 Structural Steel. AISC publication, Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.

3.3.2 Cold-Formed Steel. AISI publication, Specifications for the Design of Cold-Formed Steel Structural Members.

3.3.3 Welding. AWS publication D-1.1.

3.4 EXTERIOR COVERING. The maximum deflection under applied wind load for wall sheets and applied vertical live load for roof sheets shall not exceed 1/80th the span between supports. This maximum deflection shall be based on the sheet being continuous across two or more supports and unfastened and free to rotate. Other design requirements shall conform to the following publication.

3.4.1 Steel. AISI, Specifications for the Design of Cold-Formed Steel Structural Members.

3.5 GUTTERS AND DOWNSPOUTS shall be designed to carry the flow from the roof resulting from rain falling at the rate of 5.5 inches per hour for a five minute duration.

3.6 LOUVERS shall be adjustable type designed for a minimum net open area of 12 square feet, to be rainproof, and to resist vibration when air is passed at the rate of 2600 cubic feet per minute.

3.7 CONTINUOUS ROOF VENTILATORS shall be ridge mounted gravity type designed for a minimum capacity of 2600 cubic feet of air per minute for each 10-foot section based on a wind velocity of 4 miles per hour and an exterior-interior temperature differential of 10°F and without screens in place.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit, for approval, items as listed in the following categories:

4.1 CATEGORY I.

4.1.1 Shop painting and finishing specification.

4.1.2 Design data and catalog cuts edited to show fully, but only, the buildings and building components required.

4.1.3 Erection drawings, construction manuals, and other data necessary to describe design, sizes, materials, structural connections, structural properties of building members, fasteners, and foundation details.

4.1.4 Except for computer programmed designs, engineering design calculations for structural members and covering components. For computer programmed designs, submittals shall be accompanied by stress values and the design criteria and procedures used, and attesting to the adequacy and accuracy of the design.

4.1.5 All design calculations and drawings to be signed by a registered professional engineer.

4.2 CATEGORY II, DESCRIPTIVE DATA.

Accessories (flashing, trim, etc.).

Covering (roof and wall).

Fasteners.

Insulation (including thickness computation).

Gaskets and insulating compounds.

Sealants.

Wall liner.

Windows and doors.

Ventilators.

Gutters and downspouts.

Instruction manuals.

5. GUARANTEE. Notwithstanding the requirements of SECTION: WARRANTY OF CONSTRUCTION, the building shall be guaranteed against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of five years. Such guarantee shall start upon final acceptance of the work or the date the Government takes possession, whichever is earlier.

6. DELIVERY AND STORAGE. Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials other than framing and structural members shall be covered with weathertight coverings and kept dry. Storage accommodations for roof and wall covering shall provide good air circulation and protection from surface staining.

7. BUILDING COMPONENTS.

7.1 GENERAL. The size and weight of prefabricated components shall permit easy handling in the field. Each piece or part of the assembly shall be clearly and legibly marked.

7.2 FRAMING AND STRUCTURAL MEMBERS shall conform to the following requirements.

7.2.1 Structural Pipe or Tubing. ASTM A 53, A 252, A 500, A 501 or A 618.

7.2.2 Steel (1/8 inch thick or more). ASTM A 36, A 529 or A 572.

7.2.3 Steel (Less than 1/8 inch thick). ASTM A 570, A 606 or A 607.

7.2.4 Light Steel Sheet. ASTM A 446, 0.0516 inch thick or thicker, coating designation G90.

7.3 WALL AND ROOF COVERING.

7.3.1 Base Materials, Thickness and Finish shall conform to the following.

7.3.1.1 Aluminum-Coated Steel. MIL-S-4174, Type II, 0.0217 inch minimum thickness, factory color finished.

7.3.1.2 Aluminum. ASTM B 209, 0.032 inch minimum thickness, factory color finished.

7.3.2 Size and Shape. All sheets shall be square cut, except gable end wall sheets may be cut in the shop to correspond to the roof slope and may have a horizontal joint at the eave line. Other requirements are as follows:

7.3.2.1 Interlocking Ribs or Overlapping Configurations. The side of sheets shall have interlocking ribs or configurations for overlapping adjacent sheets. Depth of configurations for roof covering shall be not less than 1 inch.

7.3.2.2 Minimum Width of Cover shall be 12 inches for sheets with interlocking ribs and 24 inches for sheets with overlapping configurations.

7.3.2.3 Lengths of sheets shall be sufficient to cover the entire length of any unbroken roof slope or the entire height of any unbroken wall surface.

7.4 MISCELLANEOUS COMPONENT shall be fabricated of aluminum or zinc-coated steel of the same minimum thickness as covering unless otherwise specified.

7.4.1 Fasteners for securing covering and accessory items shall be aluminum or 300 or 400 series corrosion resisting steel. Gasketed washers of a material compatible with the covering and with a minimum diameter of 3/8 inch for structural connections shall be provided to waterproof the fastener penetration on the exterior side. Gasketed portion of washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick. (When wall covering is factory color finished, exposed wall fasteners shall be factory color finished or provided with plastic color caps to match the covering.)

7.4.2 Accessories. Flashing, trim, metal closure strips, caps, gutters and downspouts, and similar metal accessories of zinc-coated steel to be used with aluminum or aluminum-coated steel covering shall be painted. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering.

7.4.2 Louvers, and Continuous Roof Ventilators shall be complete with insect screens. Continuous roof ventilators shall be furnished in 8- to 10-foot long sections braced at the midpoint and shall have chain-operated dampers.

7.5 DOORS.

7.5.1 Hinged Doors. Doors and frames shall conform to Fed. Spec. RR-D-575. Exterior doors shall have top and bottom edges closed flush with a formed metal channel and sealed against water penetration. Hardware shall be provided under SECTION: HARDWARE BUILDERS (General Purpose).

7.5.2 Upward Acting Sectional Doors shall be industrial type of standard manufacture, fabricated of 22 galvanized sheet gage steel or heavier for both inside and outside faces with insulation U value of 0.74. Accessories shall include galvanized steel track, torsion-spring mechanism, ball bearing rollers, cylinder lock, and weatherstripping. Doors shall be manually operated.

7.6 WINDOWS shall be of steel in accordance with the SWI publication, Recommended Specifications for Steel Windows. Windows shall be of the size and type shown. Glazing shall be provided under SECTION: GLASS AND GLAZING.

7.7 INSULATION shall be of sufficient thickness to provide a coefficient of heat transmission or U-value not in excess of 0.15 for walls and 0.1 for roof when determined for winter conditions in accordance with the ASHRAE Handbook, Fundamentals. Insulation shall have a facing providing a permeability of 1.0 perm or less when tested in accordance with ASTM E 96. Facing shall be white, either of reinforced foil with a vinyl finish or sheet vinyl except unreinforced foil with a natural finish may be used in concealed locations. Facings and finishes shall be factory applied. Insulation, including facings and finishes, shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84.

7.7.1 Rigid or Semirigid Board Insulation shall conform to Fed. Spec. HH-I-558, Form A, Class 1 or Class 2. Exposed insulation shall have a white nondusting and nonshedding painted finish.

7.7.2 Blanket Insulation shall conform to Fed. Spec. HH-I-558, Form B, Type I, Class 6. Exposed insulation shall have a white sheet vinyl facing.

7.8 INSULATION RETAINERS. Metallic retaining members shall be nonferrous or have a nonferrous coating. nonmetallic retaining members, including adhesive used in conjunction with mechanical retainers or at insulation seams, shall have a fire resistance classification not less than that permitted for the insulation.

7.9 WALL LINER shall be steel of the same minimum thickness and material specified for covering, formed or patterned to prevent waviness and distortion, and shall extend from the floor to a height of 8 feet above the floor. Matching metal trim shall be provided at base of wall liner, top of wall liner, and around openings in walls and over interior corners.

7.10 SEALANT shall be as recommended by the manufacturer, as best suited for the particular job.

7.11 GASKETS AND INSULATING COMPOUNDS shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

8. SHOP PAINTING. Ferrous surfaces shall be cleaned of oil, grease, loose rust, loose mill scale, and other foreign substances and shop primed. Primer coating shall be in accordance with

manufacturer's standard system. Gutters, downspouts, louvers, and ventilators shall be shop painted in the manufacturer's standard color.

9. FACTORY COLOR FINISH. Wall covering and roof covering shall be color finished on both sides at the factory. Surfaces shall be prepared for coating by thoroughly cleaning, pretreating, and priming, to provide a film which is compatible with the metal surface and the color finish. Color finish shall consist of a synthetic resin base coating that has been suitably plasticized and stabilized against heat and light. Dry-film coating thickness of the color coat shall be not less than 0.8 mil for exterior surface finish and not less than 0.5 mil for interior surface finish. The exterior finishing system shall meet the quality standards specified in the Aluminum Association publication, Color and Quality Standards for Painted Aluminum Sheet, except that for salt spray resistance exposure shall be 450 hours and maximum undercutting from the scored line shall not exceed 1/8 inch. Colors shall be as selected from manufacturer's standard colors.

10. ERECTION.

10.1 GENERAL. Erection shall be in accordance with the approved erection instructions and drawings. Dissimilar materials which are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations will be rejected. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, and other foreign materials. Concrete work is specified in SECTION: CONCRETE.

10.2 FRAMING AND STRUCTURAL MEMBERS. Anchor bolts shall be accurately set by template while the concrete is in a plastic state. Uniform bearing under base plates and sill members shall be provided using a nonshrinking grout when necessary. Members shall be accurately spaced to assure proper fitting of covering. As erection progresses, the work shall be securely fastened to resist the dead load and wind and erection stresses.

10.3 WALL COVERING AND ROOF COVERING. Stained, discolored or damaged sheets shall be removed from the site. Wall covering shall be applied with the longitudinal configurations in the vertical position; roof covering shall be applied with the longitudinal configurations in the direction of the roof slope. Except for self-framing buildings, end laps shall be made over framing members with fasteners into framing members approximately 2 inches from the end of the overlapping sheet. Side laps shall be laid away from the prevailing winds. Side lap distances, end lap distances, joint sealing, and spacings of fasteners shall be in accordance with the manufacturer's standard

practice insofar as the maximum fastener spacing specified are not exceeded. Spacing of fasteners shall present an orderly appearance and shall not exceed: 8 inches on center at end laps of covering; 12 inches on center at connection of covering to intermediate supports; 12 inches on center at side laps of roof coverings; and 18 inches on center at side laps of wall covering except when otherwise approved. Fasteners shall be installed in straight lines within a tolerance of 1/2 inch in the length of a bay. Side laps and end laps of roof and wall covering and joints at accessories shall be sealed. Fasteners shall be driven normal to the surface and to a uniform depth to properly seat the gasketed washers. Accessories shall be fastened into framing members.

10.4 GUTTERS AND DOWNSPOUTS shall be rigidly attached to the building and installed to provide drainage. Gutter shall be designed with adequate provisions for expansion and contraction.

10.5 LOUVERS AND VENTILATORS shall be rigidly attached to the supporting construction and sealed to assure a rain-tight installation.

10.6 DOORS AND WINDOWS, including frames and hardware, shall be anchored plumb and true to the supporting construction and shall be adjusted as necessary to provide proper operation.

10.7 INSULATION. Except as otherwise shown or approved, insulation shall be installed against covering and between supporting members and in a manner to present a neat appearance. Blanket insulation shall have facing at joints lapped and fastened in a manner that will provide tight joints. Exposed rigid or semi-rigid insulation in ceilings shall be securely fastened without loose joints and unsightly sags. Insulation retainers shall be securely fastened in place.

11. FIELD PAINTING. Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same material used for the shop coat. Shop-primed ferrous surfaces exposed on the outside of the building and all shop-primed surfaces of doors and windows shall be painted with two coats of an approved exterior enamel. Factory color finished surfaces shall be touched up as necessary with the manufacturer's furnished touch-up paint.

ZERO ACCIDENTS
SECTION 15A
PLUMBING, GENERAL PURPOSE

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- | | |
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| 5. Electrical Work | System |
| 6. Excavating, Trenching and | 19. Pipe Sleeves, Hangers |
| Backfilling | and Fixture Supports |
| 7. Soil, Waste, Drain & Vent Piping | 20. Floor, Wall and |
| 8. Pipe Cleanouts | Ceiling Escutcheons |
| 9. Flashings | 21. Painting |
| 10. Traps | 22. Types of Fixtures and |
| 11. Drains | Fixture Trimmings |
| 12. Water Pipe, Fittings and | 23. Inspection, Tests and |
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| 13. Valves | 24. Guarantee for Water |
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| 15. Hose Faucets | |

Attachments: Fig. 2

1. APPLICABLE PUBLICATIONS. The publications listed below for a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.)

O-C-114B & Am-2	Calcium Hypochlorite, Technical
O-S-602E	Sodium Hypochlorite Solution
BB-C-120C	Chlorine, Technical: Liquid
QQ-C-40 & Am-2	Calking: Lead Wool and Lead Pig
QQ-L-201f & Am-2	Lead Sheet
QQ-S-571E & Am-2	Solder, Tin Alloy; Tin-Lead Alloy; and Lead Alloy
TT-C-00598C (COM-NBS) & Am-1	Calking Compound, Oil and Resin Base Type (for Building Construction)

TT-P-1536A	Plumbing Fixture Setting Compound
WW-N-351C & Int. Am-1 (YD)	Nipples, Pipe, Threaded
WW-P-521G	Pipe Fittings, Flange Fittings, and Flanges Steel and Malleable Iron (Threaded and Butt-Welding) Class 150
WW-P-541D/GEN (GSA-FSS) & Am-1	Plumbing Fixtures (Land Use) (General Specification)
WW-P-541/1A (GSA-FSS) & Am-1	Plumbing Fixtures (Water Closets, Land Use) (Detail Specification)
WW-P-541/4A (GSA-FSS)	Plumbing Fixtures (Lavatories, Land Use) (Detail Specification)
WW-U-516B	Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections
WW-U-531E	Unions, Pipe, Steel or Malleable Iron; Threaded Connection, 150 lb and 250 lb
WW-V-54D & Int. Am-3 (GSA-FSS)	Valve, Gate, Bronze (125, 150 and 200 Pound) Threaded Ends, flange Ends, Solder End and Brazed Ends, for Land Use
WW-V-58B	Valves, Gate, Cast Iron; Threaded and Flanged of Land Use

1.2 FEDERAL STANDARD (Fed. Std.)

H28 & Suppl. 1	Screw-Thread Standards for Federal Services
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1.3 MILITARY SPECIFICATIONS (Mil. Spec.)

MIL-T-27730A (ASG)	Tape, Antiseize, Polytetrafluoroethylene, with Dispenser
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1.4 AMERICAN INSURANCE ASSOCIATION (AIA) PUBLICATION

National Building Code (1976 & Amend., December 1977)

1.5 AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI) STANDARDS

A112.1.1-1971 (Rev July 1980)	Pipe-Applied Atmospheric-Type Vacuum Breakers
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A112.21.1-1968 (R 1974)	Floor Drains
B16.9-1978 & Errata	Factory Made Wrought Steel Buttwelding Fittings
B16.18-1978	Cast copper Alloy Solder-Joint Pressure Fittings
B16.22-1980	Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
B16.26-1975	Cast Copper Alloy Fittings for Flared Copper Tubes
B31.1-1980 & B31.1a-1980 & B31.1b-1981 & B31.1C-1981	Power Piping

1.6 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATIONS

A 74-81	Cast Iron soil Pipe and Fittings
A 120-81	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses
B 62-82	Composition Bronze or Ounce Metal Castings
B 88-81	Seamless Copper Water Tube
C 564-70-1982	Rubber Gaskets for Cast Iron Soil Pipe and Fittings

1.7 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) PUBLICATIONS

Boiler and Pressure Vessel Code & Interpretations:

Section IX Welding and Brazing Qualifications (1980;
Addenda: Summer & Winter 1980; 1981

1.8 MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS) PUBLICATIONS

SP-58	Pipe Hangers and Supports-Materials, Design, and Manufacture (1975)
SP-69	Pipe Hangers and Supports-Selection and Application (1976)

1.9 NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS
(NAPHCC) STANDARD

National Standard Plumbing Code (1978, 1979 Supplement)

2. GENERAL. The general arrangement of the plumbing shall be as indicated. Equipment, materials and fixtures required shall be furnished and installed by the Contractor. Material and equipment shall be suitable for the pressures and temperatures encountered. Installation shall be as required by the NAPHCC National Standard Plumbing code and as specified herein.

2.1 UTILITIES. Water and drainage piping shall be extended 5 feet outside the building where the piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Utilities shall be installed below the frostline, with minimum cover requirements as specified in SECTION: EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS. If the trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means.

2.2 CROSS CONNECTIONS AND INTERCONNECTIONS. No plumbing fixture, device, equipment, or pipe connection shall be installed that will provide a cross connection or interconnection between a potable water supply and any source of nonpotable water, such as a drainage system, a soil or waste pipe, or a boiler or cooling tower where the water may be chemically treated.

2.3 CONNECTIONS TO EQUIPMENT AND FIXTURES. The Contractor shall provide all necessary material and labor to connect to the plumbing system all fixtures and equipment having plumbing connections, which are specified in other sections of these specifications. Drainage connections shall be trapped. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with an integral stop, shall be equipped with a cutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to all fixtures, faucets, hydrants, showerheads, and flush valves shall be anchored to prevent movement.

2.4 DRAWINGS. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing required fittings, traps, valves, and accessories to meet such conditions.

2.5 CUTTING AND REPAIRING. The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided.

Damage to buildings, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved.

2.5 PROTECTION TO FIXTURES, MATERIALS AND EQUIPMENT. Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. Upon completion of all work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated.

2.7 WELDING. Welding of structural members, pipe and vessels shall be provided where specified or indicated. The Contractor is responsible for welding done by his organization and shall conduct tests required to qualify the welding procedures he uses in the construction of weldments. Welding of structural members shall be as specified in SECTION: MISCELLANEOUS METAL. Welding of vessels and pipes shall be in compliance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code and paragraph 127.5.3. of ANSI B31.1.

2.8 PARTS DATA. In accordance with SECTION: SPECIAL PROVISIONS and, after approval of equipment, the Contractor shall furnish a complete parts list, including recommended spare parts and maintenance supplies, and source of supply, for each item of operable equipment.

2.9 VERIFICATION OF DIMENSIONS. The Contractor shall coordinate and properly relate his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Contracting Officer of any discrepancy before performing any work. Materials, fixtures and equipment shall fit into the space allotted without interference to building features or other equipment and with adequate and acceptable clearances allowed for entry, servicing and maintenance.

3. MATERIALS, FIXTURES, AND EQUIPMENT shall conform to the respective publications and other requirements specified below, except that items which are not covered by references in this paragraph shall be as specified elsewhere in this section and as shown on the drawings. Materials, fixtures and equipment shall be the products of manufacturers regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening and shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

3.1 CALKING

3.1.1 Compound. Fed. Spec. TT-C-598, Type I.

3.1.2 Lead. Fed. spec. QQ-C-40, Type I.

3.2 FITTINGS

3.2.1 Cast-Iron Soil Pipe Fittings. ASTM A 74.

3.2.2 Fittings for Copper Tubing. Wrought copper and copper-alloy solder-joint pressure fittings shall conform to ANSI B16.22. Cast copper alloy solder-joint pressure fittings shall conform to ANSI B16.18. Flared brass fittings shall conform to ANSI B16.26 and ASTM B 62.

3.2.3 Malleable Iron Fittings. Fed. Spec. WW-P-521, Type I, except that Type II shall be used where connected to zinc coated piping.

3.2.4 Welding Fittings. ANSI B16.9.

3.2.5 Nipples. Fed. Spec. WW-N-351, same material as pipe system where used.

3.2.6 Unions. Fed. Spec. WW-U-516 or WW-U-531, as applicable and where used in connection with tubing modified therefor.

3.4 PIPE AND TUBING

3.4.1 Cast Iron Soil Pipe. ASTM A 74 and as modified hereinafter.

3.4.2 Copper Tubing. Copper tubing for water and oil piping shall conform to ASTM B 88, type as specified hereinafter.

3.4.3 Steel Pipe. ASTM A 120, Schedule 40. Black pipe for welding shall be beveled.

3.4.4 Pipe Hangers and Supports. MSS SP-58 and SP-69, types as specified.

3.5 PLUMBING FIXTURES. Fed. Spec. WW-P-541, without chair carriers.

3.6 PLUMBING FIXTURE SETTING COMPOUND. Fed. Spec. TT-P-1536, Type II.

3.7 SHEET LEAD. Fed. Spec. QQ-L-201, Grade B.

3.8 SOLDER. Fed. Spec. QQ-S-571, composition Sn50.

3.11 PACKING. Twisted jute or oakum, dry type, for calking cast iron pressure pipe; tarred type, or as specified hereinafter, for calking cast iron soil pipe.

3.12 TAPE FOR THREADED PIPE JOINTS. Mil. Spec. MIL-T-27730.

3.13 VALVES

3.13.1 GATE VALVES. Fed. Spec. WW-V-54, Type I, II, or III, Class A or B, or Fed. Spec. WW-V-58, Type I or II, Class 1 or 2, as applicable; and where used in connection with tubing, modified therefor.

3.13.2 CHECK VALVES. Fed. Spec. WW-V-51 Class A or B, Type as suitable for the application, and where used in connection with tubing, modified, therefore.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section:

4.1 CATEGORY I

Backflow Prevention Devices

Electric Water Heaters (Instantaneous Type)

4.2 CATEGORY II

4.2.1 For Approval

Fixtures and Fixture Supports

Floor Drains

System Test Reports

4.2.2 For Information Only

Parts Data

Certificate for Propane Storage Tanks if not listed or labeled by Underwriters' Laboratories.

5. ELECTRICAL WORK. Motors, manual or automatic motor control equipment except where installed in motor control centers, and protective or signal devices required for the operation specified herein shall be provided under this section in accordance with SECTION: ELECTRICAL WORK, INTERIOR. Any wiring required for the operation specified herein, but not shown on the electrical plans, shall be provided under this section in accordance with SECTION: ELECTRICAL WORK, INTERIOR.

6. EXCAVATING, TRENCHING AND BACKFILLING is specified in SECTION: EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

7. SOIL, WASTE, DRAIN AND VENT PIPING. Underground soil, waste and drain pipe and fittings shall be service weight hub-type cast iron except that hubless cast iron pipe may be installed in locations where

piping can be removed and replaced. Hubless cast iron pipe shall not be installed under concrete floor slabs on grade. Aboveground vent piping, shall be galvanized steel. Fittings on dry vents shall be regular pattern type.

7.1 INSTALLATION

7.1.1 Drainage and Vent Pipes. Main vertical soil and waste stacks shall ~~be extended full size to the roof line and above as vents~~, except where otherwise specifically indicated. Where practicable, two or more vent pipes shall be connected and extended as one pipe through the roof. Vent pipes in roof spaces shall be run as close as possible to the underside of the roof without forming traps in pipes, using fittings as required. Vertical vent pipes may be connected into one main vent riser above vented fixtures. Horizontal waste lines receiving the discharge from two or more fixtures shall be provided with end vents, unless separate venting of fixture is noted. Underground cast iron soil pipe shall be extended to 6 inches above the lowest floor where the floor is supported on the ground. Horizontal waste lines shall be sloped to drain at 1/4-inch/ft. unless otherwise indicated or approved.

7.1.2 Fittings. Change in pipe size on soil, waste and drain lines shall be made with reducing fittings. Changes in direction shall be made by the use of fittings.

7.1.3 Union Connections. Slip joints will be permitted only in trap seals on the inlet side of the traps and on "P" trap assemblies consisting of an adjustable "P" trap and waste tubing to wall with escutcheons as specified hereinafter. Tucker or hub drainage fittings shall be used to make union connections wherever practicable. Use of bushings will not be permitted.

7.2 JOINTS. Installation of pipe and fittings shall be made in accordance with the manufacturers' recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Threaded joints shall have American National taper pipe threads conforming to Fed. Std. H28, with graphite or inert filler and oil, with an approved graphite compound, or with polytetrafluoroethylene tape applied to the male threads only.

7.2.1 Cast Iron Soil Pipe. Joints in hub type cast iron soil pipe and fittings shall be firmly packed with either tarred twisted jute or a preservative-treated twisted jute covered with a braided yarn jacket to provide a uniform rope-like strand and calked with lead at least 1 inch deep. Joints in cast iron soil pipe and fittings using a double-seal, compression-type molded neoprene gasket shall be provided with a modified hub as required to provide a positive seal. Joints in cast iron soil pipe and fittings without hubs shall be made using a mechanical compression-type coupling consisting of a neoprene collar, stainless-steel band with transverse

corrugations and two stainless steel clamps with stainless steel setscrews all assembled to provide a positive seal and shall conform to CISPI Standard 310.

8. PIPE CLEANOUTS shall be the same size as the pipe. A cleanout installed in connection with cast-iron soil pipe shall consist of a long sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra heavy cast brass or cast iron ferrule with counter-sunk cast brass head screw plug shall be calked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast brass screw plugs of the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks.

9. FLASHINGS. Pipes passing through waterproofing membrane shall be flashed as specified per paragraph: PIPE SLEEVES, HANGERS, AND FIXTURE SUPPORTS. A sheet-lead flashing shield shall be provided for drains and pipe sleeves with integral clamping devices that penetrate a membrane. Flashing shield shall be made from sheet lead not lighter than 4-pound, and extend not less than 8 inches from the drain or sleeve in all directions. Flashing shall be inserted into the clamping device and made watertight. Pipes passing through pitched roofs shall be flashed using lead flashing with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal.

10. TRAPS. Each fixture and piece of equipment requiring connections to the drainage system shall be equipped with a trap. Each trap shall be placed as near the fixture as possible, and no fixture shall be double trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe shall be recess drainage pattern as specified hereinafter.

11. DRAINS. Drains shall be as specified hereinafter. The size of the drains shall be determined by the branch sizes indicated. Where metallic drains with an inside calk connection are furnished, a neoprene rubber gasket may be installed between the drain outlet and the waste pipe in lieu of a calked joint, provided the drain is specifically designed for the rubber gasket compression type joint. The neoprene rubber gasket shall conform to ASTM C 564 and shall be installed as recommended by the manufacturer. Certified independent laboratory tests shall be provided indicating that the rubber gasket compression joint will not leak when tested with not less than 5 feet head of water for not less than 1 hour.

11.1 FLOOR DRAINS

11.1.1 D1 Drains shall generally consist of a body, integral seepage pan and adjustable strainer with perforated or slotted grate and threaded collar. Drains shall be of double drainage

pattern suitable for embedding in the floor construction. The seepage pan shall have weep holes or channels which will provide drainage from the pan to the drain pipe. The strainer shall be adjustable to varying floor thicknesses. A suitable clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Cast iron floor drains shall be installed in all locations. Drains shall have a heavy cast iron body and seepage pan and a chromium plated brass or nickel bronze strainer. Drains shall be provided with threaded or inside calked connections. Drains shall be provided with separate cast iron "P" traps unless otherwise indicated. Drains shall have circular body, seepage pan, and strainer, unless otherwise indicated. Cast iron floor drains shall conform to ANSI A112.21.1, Fig. 3.3.

11.1.2 D4 Drains shall be plain pattern with perforated or slotted hinged grate and bottom outlet. The drain shall be of circular or square pattern. Drains shall be cast iron with manufacturer's standard coating. Outlet shall be suitable for inside calked connection to drain pipe.

12. WATER PIPE, FITTINGS AND CONNECTIONS

12.1 WATER PIPE. Water service pipe to the structure and cold-water piping underground within the structure shall be Type K copper tubing. Water service pipe shall extend from approximately 6 inches above the lower floor or inside the structure wall to a point not less than 5 feet outside the structure into undisturbed soil. Cold-water pipe aboveground and inside the structure shall be Type L copper tubing. Domestic hot-water piping aboveground shall be Type L copper tubing. Exposed cold and hot-water supply piping shall be chrome plated brass pipe to the shutoff or stop valve of each fixture. Piping connection from the shutoff or stop valve to the fixture shall be as specified hereinafter.

12.2 FITTINGS. Fittings for Type K copper tubing shall be flared brass or solder type bronze or wrought copper. Fittings for Type L copper tubing shall be solder type bronze or wrought copper. Fittings for chrome-plated tubing shall be chrome-plated brass.

12.3 INSTALLATION. A gate valve and drain on the service line shall be installed inside the building as close to the floor or wall as possible. Service piping shall be installed below the frostline. The piping shall be extended to all fixtures, outlets and equipment from the gate valve. The hot-water and cold-water piping systems shall be installed so as to be drained.

12.3.1 Mains, Branches and Runouts. Piping shall be installed as indicated. Pipe shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken structural portions of the building. Aboveground piping shall be run parallel with the Lines of the building unless otherwise indicated.

Branch pipes from service lines may be taken from top, bottom or side of main, using such crossover fittings as may be required by structural or installation conditions. Supply pipes, valves and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2-inch between finished covering and other work and not less than 1/2-inch between finished covering on the different services. No water pipe shall be buried in floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted. Change in direction shall be made with fittings except that bending of pipe 4 inches and smaller will be permitted provided a pipe bender is used and wide sweep bends are formed. The centerline radius of bends shall not be less than 6 diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening or other malformations will not be accepted.

12.3.2 Pipe Drains indicated shall consist of 1/2 inch globe valves with renewable disks and 3/4 inch hose nipples. Provide 1/2-inch brass plugs or caps at all other low points. Disconnection of the supply piping at the fixture is an acceptable drain.

12.3.3 Expansion and Contraction of Piping. Allowance shall be made throughout for expansion and contraction of pipe. Each hot water and hot water circulation riser shall have expansion loops where indicated. Risers shall be securely anchored when indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on all branch runouts from mains to risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that the piping will spring enough to allow for expansion without straining.

12.3.4 Air Chambers shall be provided on cold water supplies and shall be located as indicated on the drawings and as specified. Air chambers shall be accessible. Air chambers shall consist of a 12-inch length of pipe of the same diameter as the branch supply, capped.

12.4 JOINTS. Connections between ferrous and nonferrous metallic pipe installed underground and connections to water heaters shall be made with dielectric unions specified hereinafter. Installation of pipe and fittings shall be made in accordance with the manufacturers' recommendations. Threaded joints shall have American Standard taper pipe threads conforming to Fed. Std. H28, with graphite or inert filler and oil, with an approved graphite compound, or with polytetrafluoroethylene tape applied to the male threads only. Unions shall be provided where required for disconnection. When dielectric unions are used, coordinate with SECTION: ELECTRICAL WORK, INTERIOR for grounding.

13. VALVES shall be provided on supplies to equipment or fixtures if not specified in paragraph: TYPES OF FIXTURES AND FIXTURE TRIMMINGS. Valves in connection with runouts, risers, branches, and mains shall be in accordance with these specifications and installed where indicated. All valves shall be gate valves unless otherwise specified or indicated. Valves up to and including 3 inches shall be bronze with threaded ends for pipe and sweat type connections for tubing.

14. UNIONS AND FLANGES. Unions on copper tubing 2 inches in diameter and smaller shall be composition B, conforming to Fed. Spec. WW-U-516. Unions shall not be concealed in walls, ceilings or partitions. Dielectric unions shall meet the dimensional requirements and tensile strength of pipe unions in accordance with Fed. Spec. WW-U-531. Dielectric unions shall be suitable for the required operating pressures and temperature conditions. Dielectric unions shall have metal connections on both ends of union. The ends of the unions shall be threaded or soldered to match adjacent piping. The metal parts of the dielectric union shall be separated to prevent current flow between the dissimilar metals.

15. HOSE FAUCETS shall be brass with 1/2-inch male inlet threads, hexagon shoulder, and 3/4-inch hose connection.

16. VACUUM BREAKERS FOR FAUCETS shall be tested and approved in conformance with ANSI A112.1.1. They shall be installed as required by NAPHCC National Standard Plumbing Code. Vacuum breakers shall have brass or bronze body with bronze or corrosion resisting steel parts and suitable disks. The breakers shall be suitable for hot or cold water service as required.

17. ELECTRIC WATER HEATER shall be instantaneous type. Capacity shall be 0.4 gpm with a temperature rise of 100°F. Power requirements shall be 6KW and 208V. A built-in safety temperature switch shall be incorporated to prevent overheating. The unit shall be capable of operating up to 200 psi.

18. PNEUMATIC WATER SUPPLY SYSTEM

18.1 GENERAL. A pneumatic water supply system shall be provided in the Treatment Building. The system shall be complete with pump, pneumatic tank and accessories to provide water to the system at a minimum of 25 psi and a maximum of 50 psi.

18.2 PUMP. A centrifugal type booster pump shall be furnished and installed in the cold water system as shown on the drawings. The pump shall be a close-coupled capable of delivering 30 gpm at 105 feet of head. The pump shall be single stage, single end suction design of cast iron bronze fitted construction. The pump shall be equipped with packed stuffing boxes with suitable number of rings of graphited asbestos packing. The pump liquid shall lubricate the packing. Test curves shall be furnished showing capacity in gallons per minute, head in feet, efficiency and brake horsepower. The electric motor shall be of such a size that it will not be overloaded when operating at any

point along the characteristic curve of the pump. Pump motor shall operate on 480V, 3Ø power.

18.3 CONTROLS. Pump shall be automatically started and stopped by a pressure switch located in the pneumatic tank serving the washdown faucets, emergency showers and lavatory. Pressure switch shall be SPST snap action for 120V operation. The switch shall be capable of picking up a 10A inductive load, which may require an interposing relay. The interposing relay, if required, shall be mounted in the MCC.

19. PIPE SLEEVES, HANGERS AND FIXTURE SUPPORTS shall be furnished and set, and the Contractor shall be responsible for their proper and permanent location.

19.1 PIPE SLEEVES. Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall not be required for cast iron soil pipe passing through concrete slab on grade except where penetrating a membrane waterproof floor or for supply and waste piping thru the wall supporting the fixture. The space between the pipe and wall shall be calked with sealant conforming to TT-C-598. Sleeves shall not be installed in structural members except where indicated or approved. All rectangular and square openings shall be as detailed on the drawing. Each sleeve shall extend through its respective wall, floor, or roof, and shall be cut flush with each surface except where clamping flanges are used. Unless otherwise indicated, sleeves shall be of such size as to provide a minimum of 1/4-inch all around clearance between bare pipe and sleeves. Sleeves in bearing walls shall be steel pipe or cast iron pipe. Sleeves for membrane waterproof floors shall be steel pipe, cast iron sleeve, plastic pipe, or approved pipe. Membrane clamping device shall be provided on pipe sleeves for waterproof floors. Sleeves in nonbearing walls, nonwater-proof floors, or ceilings may be steel pipe, cast iron pipe, galvanized sheet metal with lock type longitudinal seam or moisture-resistant fiber or plastic. Except as specified below, the annular space between pipe and sleeve shall be sealed as indicated and specified in SECTION: CALKING AND SEALANTS. The annular space between pipe and sleeve will not be sealed for interior walls or pipe chase areas which are not designated as fire rated. Penetrations through fire rated interior walls and pipe chase areas shall be sealed to maintain fire rating.

19.1.1 Pipes Passing through Roof or Floor Waterproofing Membrane shall be installed through a 4-pound lead flashing each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and calked after placing the ferrule. The annular space between the flashing and the bare pipe shall be sealed as

indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. At the Contractor's option, pipes up to and including 10 inches in diameter passing through roof or floor waterproofing membrane may be installed through a cast iron sleeve with calking recess, anchor lugs, flashing clamp device and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device.

19.1.2 Waterproofing at Water Closets shall be accomplished by forming a flashing guard from lead. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drain pipe and the inside diameter of the cast iron or steel sleeve. The turned down portion of the flashing guard shall be imbedded in sealant to a depth of approximately 1-1/2 inches, then the sealant finished off flush to floor level between the flashing guard and drain pipe. The flashing guard of lead shall extend not less than 8 inches from the waste pipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. At the option of the Contractor, when cast iron water closet floor flanges are used, the space between the pipe sleeve and drain pipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1 1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be calked with oakum and lead to form a seal.

19.1.3 Optional Counterflashing. As an alternate to turning the flashing down into a dry vent pipe or calking and sealing the annular space between the pipe and flashing, counterflashing may be accomplished by utilizing:

- (a) A standard roof coupling for threaded pipe up to 6 inches in diameter.
- (b) A tack welded or banded metal rain shield around the pipe and sealed as indicated.

19.1.4 Optional Sealing of Uninsulated Pipes Passing through Waterproofing Membrane. At the option of the Contractor, a modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and calking and sealing, as specified above, of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve with corrosion protected carbon steel bolts, nuts and pressure plates. The link shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. The Contractor electing to use

the modular mechanical type seals shall provide sleeves of the proper diameters.

19.2 PIPE HANGERS, INSERTS AND SUPPORTS shall conform to MSS SP-58 and SP-69 except as specified hereinafter. Beam clamps shall be Types 20, 21, 22, 23, 28 or 29. A retainer shall be provided with Type 23. Angle iron or channel clamps shall be Type 20 with a malleable iron heel plate added. For piping up to and including 1-1/4-inch IPS, 3/4-inch wide, 18-gage minimum steel strap type, ring type or molded thermoplastic hangers may be used and shall be secured by screw fasteners. Hangers in contact with uninsulated copper tubing or brass pipe shall be electrolytically coated and shall be sized to suit the outside diameter of the pipe. The location of hangers and supports shall be coordinated with the structural work to assure that the structural members will support the intended load. In lieu of separate hangers or supports, the Contractor shall submit for approval a detailed drawing of the type of hanger or support he proposes to furnish for hanging and supporting multiple pipes.

19.2.1 Horizontal Piping. Hangers and supports shall be installed at intervals specified below, at locations not more than 3 feet from the ends of each runout and not over 1 foot from each change in direction of piping. Hangers shall be Types 1, 9, 10, or 11 and shall be adjustable or provided with turnbuckles type 13 or 15. Type 6 hangers may be used to support pipes from toilet rooms to main stack when space does not permit the use of turnbuckles or adjustable clevis-type hangers. Light duty clevis hangers shall conform to NFPA 13 and Appendix A thereto, Type H. Brackets for support of piping at walls shall be Type 31, 32, 33, or 34. Hangers and supports shall be spaced as follows:

19.2.1.1 Cast Iron Soil Pipe shall be supported near each hub or hubless pipe joint and at multiple fittings as required.

19.2.1.2 Steel Pipe and Copper Tubing shall be supported as specified in MSS SP-69.

19.2.1.3 Underground Piping shall be laid on a firm bed for its entire length, except where support is otherwise provided.

19.2.2 Vertical Piping. Pipe clamps shall be Type 8 for floor supports and Type 24 anchors at other locations. Supports shall be spaced as follows:

19.2.2.1 Cast Iron, Steel Pipe and Copper Tubing shall be supported at each floor, and at intervals of not more than 15 feet, not more than 8 feet from end of riser, and near vent terminations as approved. Support of piping at the floor shall not be provided for slab-on-grade floors.

19.3 FIXTURE SUPPORTS. Wall hung fixture hanger plates, support arms, or mounting lugs shall be fastened to the wall by through bolts where appearance of the bolts is not objectionable. Exposed bolt heads in finished areas shall be hexagonal and painted. Washers shall be painted to match bolt heads or nuts.

19.3.1 For Solid Masonry. Where through bolting is objectionable, fixture hanger plates, support arms, or mounting lugs shall be fastened with 1/4-inch minimum machine bolt expansion shields or 1/4-inch minimum stud type expansion bolts.

20. FLOOR, WALL AND CEILING ESCUTCHEONS. Escutcheons shall be provided at all finished surfaces where exposed piping passes through walls. Escutcheons shall be fastened securely to pipe and shall be corrosion resisting steel, chromium-plated zinc alloy or chromium-plated copper alloy, either one piece or split pattern, held in place by internal spring tension or setscrew.

21. PAINTING required for pipes, hangers, supports and other iron work in concealed spaces and painting of exposed items is specified in SECTION: PAINTING, GENERAL.

22. TYPES OF FIXTURES AND FIXTURE TRIMMINGS specified herein shall be furnished and installed complete with all trimmings and fittings, unless otherwise specified under the item. The item numbers correspond with the "P" numbers shown at the plumbing fixtures on the drawings.

22.1 GENERAL REQUIREMENTS. Plumbing fixtures shall conform to the requirements hereinafter specified and Fed. Spec. WW-P-541, unless otherwise indicated. Fixtures and trimmings not covered by Fed. Spec. WW-P-541 shall be considered special, but shall be of equal quality and material. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Angle stops; straight stops; stops integral with the faucets; or concealed type of lock-shield, loose key pattern stops for supplies shall be furnished and installed with fixtures. Piping connections from the shutoff or stop valve to the fixture shall be chrome-plated brass pipe or chrome-plated copper tubing. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Wall escutcheons shall be as specified hereinbefore. Exposed fixture trimmings and fittings shall be chromium-plated, chromium-nickel-plated, or nickel-plated brass with polished, bright surfaces. Internal parts of flush valves and pop-up stopper of lavatory waste drains, may be acetal resin, fluorocarbon, nylon, acrylonitrile-butadiene-styrene (ABS) or other suitable plastic material provided that the plastic material has provided satisfactory service under actual commercial or industrial operating conditions for a period of 2 years. Plastic in contact with hot water shall be suitable for 180°F water temperature.

22.2 FIXTURE CONNECTIONS. Where space conditions will not permit standard fittings in conjunction with the cast-iron floor flange, special short radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gastight and watertight with a closet setting compound or with a neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted for these connections. Bolts shall be not less than 1/4-inch diameter and shall be equipped with chromium-plated nuts and washers. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first class joint with the closet setting compound or gasket and fixture used.

22.3 TRAPS. Unless otherwise specified herein, P-traps shall be copper alloy adjustable tube type with slip joint inlet and swivel. Trap shall be without a cleanout. Tube shall be not less than 20-gage copper alloy having wall 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlet shall have rubber washer and copper alloy nut for slip joint above the discharge level; swivel joint shall be below the discharge level. Nuts shall have flats for wrench grip. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout.

22.5 MOUNTING HEIGHTS OF FIXTURES shall be as indicated in Table 1 below:

TALBE 1. MOUNTING HEIGHTS OF
FIXTURES FOR ORDINARY USAGE

<u>Fixture</u>	<u>Height Above Finished Floor, Inches</u>
Wall mounted lavatories	Rim to floor = 31
Floor mounted fixtures	See fixture specifications

22.6 FIXTURES. Fixtures shall be as specified in Table 3.

TABLE 3. PLUMBING FIXTURES

Item No.	Fixture	*Classification	Minimum Overall Fixture Dimensions, Inches	Other Requirements
P-1	Water Closet, floor mounted, siphon jet, elongated bowl, handle operated flush valve.	Part A - Type II, Style D, Class 6 Part C - Type IV, Class 4. Part D - Type I, Class 1, Style F1, F2, or F3; Class 2, Style F5; Class 3, Style F9, F10, or F11 as required. Part E - Type I or II, Style 1, Model A without seat bumpers.	Length = 25-1/2 Width = 14 Height = 14-1/4	Seat shall be of black molded plastic with self sustaining check hinge of plastic covered copper alloy with metal posts and fastening nuts. [Flush connection and coupling for top spud.] [Long flush connection and coupling for top spud for flush valve installation 39 inches above floor.] Flush valve handle shall be copper alloy. Flush connection shall be furnished with chromium plated metal solid or split ring type wall support to anchor flush valve.

TABIE 3. PLUMBING FIXTURES (Cont'd)

Item No.	Fixture	*Classification	Minimum Overall Fixture Dimensions, Inches		Other Requirements
			Width	Depth	
P-3	Lavatory, straight back, wall mounted.	Part A - Type I	- 20		Lavatory shall be vitreous china or enameled cast iron. Drain body and jam nuts shall be copper alloy. Faucet body and spout shall be cast or wrought copper alloy. Faucet handles shall be cast, formed, or drop forged copper alloy. Stop valves and handles shall be copper alloy. Waste trap and hexagonal nut for slip joints shall be copper alloy. Escutcheons shall be corrosion resisting steel or copper alloy. Lavatory shall be supported by wall hangers. Exposed leg support or chair carrier shall not be provided. Faucet hole spacing shall be 8 inches. Faucets shall have replaceable seats and indexed turn handles of lever or fourarm type. Interconnection between valves and spout for Part C - Type III faucets shall be of rigid type metal tubing.
		Part C - Type III	Front to back - 18		
		Part D - Type III	Back height - 3-1/2		
		Part E - Type I or II.			
		Part F - Type I, Class 1, 2 or 3.			

*Reference Fed. Spec. WW-P-541/4

TABLE 3. PLUMBING FIXTURES (Cont'd)

Item No.	Fixture	*Classification	Minimum Overall Fixture Dimensions, Inches	Other Requirements
P-7B	Emergency Shower, free standing with eye and face wash	Part A - Type II Part C - Type II Part D - Type II	Diameter of face end of shower head = 8	Shower heads shall be copper alloy. control valve bodies shall be of copper alloy and shall have metal external parts of copper alloy, nickel alloy or corrosion-resisting steel. Shower shall be free standing type as indicated on the drawings, complete with shower head, control valve and all interconnecting metal pipe and fittings. Shower control valve shall be not less than 1-inch size, self closing or ball type. Pull chain, when furnished with standing units, shall be anchored to the pipe stand. Shower head inlet shall have IPS threads for not less than 1 inch supply connection. Shower heads shall have bright or satin chromium plate finish. Eye and face wash fixture shall be corrosion resisting steel, mounted integral with free standing shower. Valves for eye and face wash fixture shall be foot or hand control type. Free standing equipment shall be secured to floor with a floor flange. Unless otherwise indicated on the drawings, size, length, shape and finish of interconnecting metal supply, drain ;and support piping shall be as standard with the manufacturer.

*Reference Fed. Spec. WW-P-541/7

23. INSPECTION, TESTS AND STERILIZATION

23.1 METHODS OF SAMPLING, INSPECTING AND TESTING FIXTURES shall conform to Fed. spec. WW-P-541.

23.2 TESTS FOR PLUMBING SYSTEMS. Soil, waste, vent, and water piping shall be tested by the Contractor and approved before acceptance. Underground soil and waste and water piping shall be tested before backfilling. Equipment required for test shall be furnished by the Contractor at no additional cost to the Government.

23.2.1 Drainage and Venting System Piping shall be tested with water or air before the fixtures are installed. After the plumbing fixtures have been set and their traps filled with water, the entire drainage and venting system shall be submitted to a final test with smoke or peppermint.

23.2.1.1 Water Test shall be applied to the drainage and venting system either in its entirety or in sections. If the entire system is tested, all openings in the pipes shall be tightly closed except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening except the highest opening of the section under test shall be tightly plugged, and each section shall be filled with water and tested with at least a 10-foot head of water. In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested so that each joint or pipe in the building except the uppermost 10 feet of the system has been submitted to a test of at least a 10-foot head of water. The water shall be kept in the system, or in the portion under test, for at least 15 minutes before the inspection starts; the system shall then be tight at all joints.

23.2.1.2 Air Test. If tests are made with air, a pressure of not less than 5 pounds per square inch shall be applied with a force pump and maintained at least 15 minutes without leakage. A mercury column gage shall be used in making the air test.

23.2.1.3 Final Test. When the smoke test is employed, the smoke shall be produced by a smoke machine, and a pressure equal to 1 inch water column shall be maintained for 15 minutes before inspection starts. When the peppermint test is used, 2 ounces of peppermint shall be introduced into each line or stack.

23.2.2 Water System. When the roughing-in is completed and before fixtures are set, the entire hot and cold-water piping systems shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gage, and proved tight at this pressure for not less than 30 minutes in order to permit inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately as specified for the entire system.

23.2.3 Defective Work. If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests repeated. Repairs to piping shall be made with new materials. No calking of screwed joints or holes will be acceptable.

23.2.4 Cleaning and Adjusting. Equipment, pipes, valves, fittings and fixtures shall be cleaned of grease, metal cuttings and sludge that may have accumulated from operation of the system during the test. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building, due to the Contractor's failure to clean the piping system properly, shall be repaired by the Contractor. When the work is complete, the hot water system shall be adjusted for uniform circulation. Flush valves and automatic control devices shall be adjusted for proper operation.

23.2.5 Operational Test. Upon completion and prior to acceptance of the installation the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system.

- a. Time, date, and duration of test
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of all fixtures and fixture trim.
- d. Operation of all valves and faucets.
- e. Temperature of domestic hot water supply.
- f. Operation of all floor drains by flooding with water.
- g. Operation of vacuum breakers.

All indicating instruments shall be read at half-hour intervals unless otherwise directed by the Contracting Officer. The report of the test shall be furnished to the Contracting Officer. The Contractor shall furnish all instruments, test equipment, and test personnel required for the tests; the Government will furnish the necessary water and electricity.

23.3 STERILIZATION. After pressure tests have been made, the entire domestic water distribution system shall be thoroughly flushed with water until all entrained dirt and mud have been removed, and shall be sterilized by chlorinating material. The chlorinating material shall be either liquid chlorine conforming to Fed. Spec. BB-C-120 or hypochlorite conforming to Fed. Spec. O-C-114 or Fed.

Spec. O-S-602, grade A or B. The chlorinating material shall provide a dosage of not less than 50 parts per million and shall be introduced into the system in an approved manner. The treated water shall be retained in the pipe long enough to destroy all non-spore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 10 p.p.m. of chlorine at the extreme end of the system at the end of the retention period. All valves in the system being sterilized shall be opened and closed several times during the contact period. The system shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 p.p.m. During the flushing period all valves and faucets shall be opened and closed several times. From several points in the system the Contracting Officer will take samples of water in properly sterilized containers for bacterial examination. The sterilizing shall be repeated until tests indicate the absence of pollution for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

24. GUARANTEE FOR WATER HEATERS, ELECTRIC. The Contractor shall furnish the Contracting Officer a warranty issued by the manufacturer of the water heater, which warranty shall inure to the Government. Said warranty shall contain the following terms and conditions: Any replacement under this warranty shall include free delivery to the project location. Said warranty is independent of and in addition to any and all other warranties and guarantees made by the Contractor under this contract and this warranty shall not relieve the Contractor of performance of any other warranties or guarantees made under this contract. The manufacturer shall warrant the complete heater assemblies to be free of defects as regards both materials and workmanship under normal use in service and shall repair or replace without installing, free of charge, all parts of heaters which may develop defects during the first year beginning with the beneficial use after acceptance of the water heater. In addition, the manufacturer shall agree that if any original heater tank becomes defective or inoperative during the first three years in use, a complete new heater of the same or equivalent model shall be supplied at no cost or shipping expense, without installing. Installation costs are not included.

ZERO ACCIDENTS
SECTION 15B
PROCESS PIPING

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| 1. Applicable Publications | 5. Workmanship |
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| 4. Submittals | 8. Testing |

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by designation only.

1.1 Federal Specifications (Fed. Spec.)

- | | |
|-----------|---|
| WW-P-521F | Pipe Fittings, Flange Fittings and Flanges, Steel and Malleable Iron (Threaded & Butt-Welding) 150 Pound. |
| WW-P-531E | Unions, Pipe, Steel and Malleable Iron: Threaded connection, 150 lb & 250 lb |

1.2 Federal Standard (Fed. Std.)

- | | |
|----------------|--|
| H28 & Suppl. 1 | Screw-Thread Standards for Federal Services. |
|----------------|--|

1.3 American Society for Testing and Materials (ASTM) Specifications

- | | |
|----------------|---|
| A-53-81a | Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless. |
| A-105-81 | Forgings, Carbon Steel, for Piping Components. |
| A126-73 (1979) | Grey Iron Castings for Valves Flanges & Pipe Fittings. |
| A-216-77 | Carbon-Steel Castings Suitable for Fusion Welding for High-temperature Service. |
| A-234-81a | Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures. |
| A 395-80 | Ferritic Ductile Iron Pressure - retaining castings for use at elevated temperatures. |

A-587-78	Electric-Welded Low - Carbon Steel Pipe for the Chemical Industry.
D 1784-81	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPCV) Compounds.
D 1785-76	Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80, & 120.
D 2146-81	Propylene Plastic Molding and Extrusions Materials.
D 2464-76	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
D 2467-76a	Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
D 2564-80	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe & Fittings.

1.4 Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Publications

SP-58	Pipe Hangers and Supports-Materials, Design and Manufacture (1975)
SP-69	Pipe Hangers and Supports-Selection and application (1976)

1.5 National Fire Protection Association (NFPA) Standards

No. 49-1975	Hazardous Chemicals Data
No. 325M-1977	Flammable Liquids, Gases and Volatile Solids
No. 704-1980	Identification of the Fire Hazards of Materials

2. GENERAL. This section covers all process piping as shown on the drawings and herein specified. Materials and equipment shall be suitable for the pressures and temperatures encountered. This section includes the below grade portion of the raw water piping between the raw water feed pumps and the treatment building and the waste piping under the floor of the treatment building and underground from the treatment building to the waste water sump.

2.1 Verification of Dimensions. The Contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work. The Contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.

3. MATERIALS AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Other materials shall be as specified elsewhere herein and as shown on the drawings and shall be the products of manufacturers regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least two years prior to bid opening.

3.1 PLASTIC PIPE AND FITTINGS

3.1.1 Polyvinyl Chloride (PVC) Pipe

ASTM D 1785-76

3.1.2 Polyvinyl Chloride (PVC) Fittings

3.1.2.1 Socket Type - ASTM D-2467-76a.

3.1.2.2 Threaded Type - ASTM D-2464-76

3.1.3 Fiberglass Reinforced Plastic (FRP) Fittings

3.1.4 Solvent Cement and Primer - ASTM D 2564-76

3.2 LINED PIPE AND FITTINGS

3.2.1 Polypropylene - PP Lined Pipe

3.2.1.1 Pipe - Std. Wt. - 1" through 4" - ASTM A-587 -
6" through 16" - ASTM A-53 Gr. B.

3.2.1.2 Flanges - Cast Ductile Iron - ASTM A 395
(60-40-18)

3.2.1.3 Forged Steel ASTM A105.

3.2.2 Polypropylene - PP - Lined Fittings

3.2.2.1 Cast Iron - ASTM A126 Class B Cast
Ductile Iron - ASTM A395 (60-40-18)
Cast Steel - ASTM A216 (GR. WCB)

3.2.3 Gaskets - TFE Envelope, Style e-18-BV.

3.3 CARBON STEEL PIPE AND FITTINGS

- 3.3.1 Pipe - ASTM A53 Grade B Schedule 40 or Schedule 80 as hereinafter specified.
- 3.3.2 Threaded Fittings - Malleable Iron - Fed. Spec. WW-P-521.
- 3.3.3 Socket-Weld Fittings - ASTM A234.
- 3.3.4 Unions Fed. Spec. WW-U-531, type to match adjacent piping.

3.4 Valves and Instruments for PVC Lines

3.4.1 PVC materials of fabrication shall be PVC compound which meets the requirements of Type 1 Grade 1 as outlined in ASTM D 1784.

3.4.1.1 Butterfly Valves shall have steel reinforced disc, replaceable EPT liner providing bubble-tight seating of disc and stainless steel shaft. Valve shall be wafer-type and lever operated up to and including 6" size and gear operated 8" and up.

3.4.1.2 Ball Valves shall be true union type with Teflon seats, EPT "O" rings and removable ABS handle and socket ends.

3.4.1.3 Check Valves shall be standard swing check design for installation in either horizontal or vertical lines.

3.4.1.4 Gate Valves shall be non-rising stem with inside screw. Polypropylene disc with PVC encased steel shaft. No metal to media contact permitted.

3.4.1.5 Pressure Relief Valves shall have a Teflon shaft and Viton seals. Any hardware not in contact with the flowing medium shall be cadmium plated.

3.4.1.6 Pressure Reducing Valves shall be iron body with renewable bronze trim and composition seat and diaphragm.

3.4.1.7 Flow Control Valves shall provide automatic metering flow control at flows specified. Valves shall be iron body with S.S. trim including pilot and orifice and Buna-N diaphragm.

3.4.1.8 Flow Indicating Recorders shall provide visible flow rate and flow recording. All parts contacting flowing medium shall be of PVC or Viton.

3.4.1.9 Gage Guards shall be of PVC bodies and Viton diaphragms.

3.5 Valves and Instruments for P-L Lines

3.5.1 Poly propylene materials of fabrication shall be polypropylene compound which meets the requirements of Type 1 as outlined in ASTM 2146.

3.5.1.1 Plug Valves shall be all iron valves with polypropylene lining on all parts exposed to the flowing medium.

3.5.1.2 Ball Valves shall be true union-type with polypropylene body, Teflon seats and EPT "O" rings.

3.5.1.3 Hose Connector shall be of quick coupling type with connection to match pipe and hose used.

3.6 Valves and Instruments for C.S. Lines

3.6.1 Gate Valves shall be bronze bodies and trim with threaded ends.

3.6.2 Pressure Reducing Valves shall be iron body with renewable bronze trim and composition seat and diaphragm.

3.7 Pipe Supports Hangers to support piping shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying and undue strain.

3.7.1 Pipe Hangers and Supports shall conform to MSS-SP58 and SP-69. Beam clamps shall be Type 20, 21, 28 or 29.

3.7.2 Horizontal Piping. The maximum spacing between pipe supports for straight runs shall comply with MSS SP-69. Pipe hangers or supports shall be spaced not over 5 feet apart at heavy fittings and valves.

3.7.2.1 Piping Supported from Above. A hanger shall be installed not over 1 foot from each change in direction of piping. Suspended piping hangers shall be Types 1, 6, 7, 9, 10 or 11. Roller supports may be used as specified in MSS SP-58 and SP-69. Type 13 or 15 turnbuckles shall be used where required for vertical adjustment of the piping. Vector forces on hanger rod from vertical angle deflection shall not exceed that allowed by MSS SP-58. Brackets for support of piping at wall shall be Type 34 unless otherwise shown.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit for approval the following items required by this section.

4.1 Category I

Valves - Butterfly, ball, plug, check, etc.
Polypropylene lined pipe spools
Polypropylene lined fittings
Flow control valves
Flow meter
Pressure gages
Strainers
Hose connectors

4.2 Category II

Parts Data
Test Reports
Operating and Maintenance Instructions

4.3 Parts Data. In accordance with SECTION: SPECIAL PROVISIONS and, after approval of equipment, the Contractor shall furnish a complete list of parts and maintenance supplies with current unit prices and source of supply, for each item of operable equipment.

5. WORKMANSHIP

5.1 General. All materials and equipment shall be fabricated and installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents.

6. PROTECTION OF MATERIALS. Before, during, and after installation, plastic pipe and fittings shall be protected from exposure to sunlight and any environment that would result in damage to or deterioration of the material. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendation and NFPA Standard 704, with classification as indicated in NFPA 49 and NFPA 325M and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use will be discarded when the recommended pot life is exceeded.

7. INSTALLATION. All piping shall be installed in accordance with manufacturer's recommendations and to the satisfaction of the Contracting Officers.

8. TESTING. Upon completion of the system tests shall be conducted on all lines at 1 1/2 times the design operating pressure to insure a complete water-tight system. The Contractor shall furnish all gages, etc. to perform the test. The Contracting Officer shall furnish any water and/or electricity required to complete the testing.

ZERO ACCIDENTS

SECTION 15C

HEATING SYSTEM - DIRECT GAS-FIRED UNITS

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1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 FEDERAL SPECIFICATIONS.

- | | |
|--------------------------------------|---|
| QQ-A-250/2D | Aluminum Alloy 3003, Plate and Sheet. |
| QQ-S-698
& Am-3 | Steel, Sheet and Strip, Low-Carbon. |
| QQ-S-766c
& Int. Am-6 | Steel Plates, Sheets, and Strip - Corrosion Resisting. |
| WW-N-351C
& Int Am-1 (YD) | Nipples, Pipe, Threaded. |
| WW-P-406D
& Int Am-1
(GSA-FSS) | Pipe, Steel (Seamless and Welded) (for Ordinary Use). |
| WW-P-521G | Pipe Fittings, Flange Fittings, and Flanges, Steel and Malleable Iron (Threaded and Butt-Welding) Class 150 |
| WW-U-531E | Unions, Pipe, Steel or Malleable Iron; Threaded Connection, 150 lb. and 250 lb. |

1.2 FEDERAL STANDARDS (Fed. Std.)

- | | |
|-------------------|---|
| H28
& Suppl. 1 | Screw-Thread Standards for Federal Services |
|-------------------|---|

1.3 AMERICAN GAS ASSOCIATION LABORATORIES (AGA) DIRECTORY.

Certified Appliances and Accessories, (July 1982 and Monthly Supplemental Directories).

1.4 AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI) STANDARDS.

B.16.33-1981 Manually Operated Metallic Gas Valves, for use in Gas Piping Systems Up To 125 psig (sizes 1/2 thru 2).

Z223.1-1980 National Fuel Gas Code (NFPA 54-1980).

1.5 AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM) PUBLICATIONS.

A48-74 Grey Iron Casting - Specs for.

1.6 MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS) PUBLICATIONS.

SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture (1975).

SP-69 Pipe Hangers and Supports - Selection and Application (1976).

SP-84 Steel Valves - Socket Welding and Threaded Ends (1978).

2. GENERAL. This section covers direct-gas-fired heating system, complete.

2.1 CONFORMANCE WITH AGENCY REQUIREMENTS. Where materials or equipment are specified to conform to requirements of the Underwriters' Laboratories, Inc., or the American Gas Association, the Contractor shall submit proof of such conformance. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, the Contractor may submit a written certificate from any approved nationally recognized testing organization adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements, including methods of testing, of the specified agency.

2.2 NAMEPLATES. Each major item of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item.

2.3 SAFETY REQUIREMENTS. Belts, pulleys, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be fully enclosed or properly guarded. High-temperature equipment and piping so located as

to endanger personnel or create a fire hazard shall be properly guarded or covered with insulation.

2.4 VERIFICATION OF DIMENSIONS. The contract drawings show the extent and general arrangement of the heating system. The Contractor shall visit the premises to become thoroughly familiar with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work. The Contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. Materials and equipment shall fit into the space allotted without interference to building features or other equipment and with adequate and acceptable clearances allowed for entry, servicing and maintenance.

2.5 PARTS DATA. In accordance with the SECTION: SPECIAL PROVISIONS, and after approval of equipment, the Contractor shall furnish a complete parts list, including recommended spare parts and maintenance supplies, and source of supply, for each item of operable equipment.

3. MATERIALS AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Other materials and equipment shall be as specified elsewhere herein and as shown on the drawings and shall be the products of manufacturers regularly engaged in the manufacture of such products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening and shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

3.1 METAL SHEETS. Equipment, appliances, and accessories shall be suitable for use with liquefied petroleum gas (LPG) in the vapor phase at a specific gravity of 1.52, and at a pressure of 30 inches of Hg and with a calorific value of 2520 BTU per cubic foot. Unless otherwise indicated, gas piping systems shall conform to ANSI Z223.1.

3.1.1 Aluminum-Clad Steel. Military Specification MIL-S-4174, Type I, Grade A, except that coating shall be not less than 0.50 ounce per square foot; nominal thickness of sheet shall be not less than 0.0478 inch (18 gage).

3.1.2 Aluminum. Fed. Spec. QQ-A-250/2, Temper H12 or H22, or Mil. Spec. MIL-A-52174, manufacturer's standard thickness.

3.1.3 Corrosion-Resisting Steel. Fed. Spec. QQ-S-766, with nominal thickness of not less than 0.0359 inch (20 gage); Class 309, 321, 347, 410, 430 or 446.

3.1.4 Low-Carbon Steel. Fed. Spec. QQ-S-698, hot- or cold-rolled, commercial quality, nominal thickness of not less than 0.0598 inch (16 gage).

3.1.5 Ceramic-Coated Steel.

Steel shall be low-carbon steel specified hereinbefore; ceramic coating shall be of such quality as will withstand specified furnace operating temperature.

3.2 CAST IRON. ASTM A 48.

3.3 ELECTRICAL MATERIALS AND APPLIANCES shall be in accordance with SECTION: ELECTRICAL WORK, INTERIOR.

3.4 PIPE FITTINGS.

3.4.1 Malleable-Iron Fittings. Fed. Spec. WW-P-521, type as required to match adjacent piping.

3.4.2 Nipples. Fed. Spec. WW-N-351, standard weight.

3.4.3 Unions. Fed. Spec. WW-U-531, type as required to match adjacent piping.

3.5 PIPE HANGERS. MSS SP-58 and SP-69.

3.6 PIPE THREADS. Fed. Std. H 28.

3.7 STEEL PIPE. Fed. Spec. WW-P-406, Weight A, Class I.

3.8 PLUG VALVES. 1-1/2 inches and smaller shall have threaded ends and conform to MSS SP-84 or ANSI B16.33.

4. SUBMITTALS. In accordance with SECTION: SPECIAL PROVISIONS, the Contractor shall submit data for the following items required by this section.

4.1 CATEGORY I.

Unit Heaters (Direct Gas Fired).

4.2 CATEGORY II.

4.2.1 For Approval.

Plug Valves.

4.2.2 For Information Only.

Parts Data.

Operating and Maintenance Instructions.

5. WORKMANSHIP. Materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer for obtaining conformance with the contract documents.

6. ELECTRICAL WORK. Motors, manual or automatic motor control equipment, except where installed in motor control centers, and protective or signal devices required for the operation specified herein shall be provided under this section in accordance with SECTION: ELECTRICAL WORK, INTERIOR. Any wiring required for the operation specified herein, but not shown on the electrical plans, shall be provided under this section in accordance with SECTION: ELECTRICAL WORK, INTERIOR.

7. UNIT HEATERS.

7.1 GENERAL. Unit heaters shall be installed where shown on the drawings. The heating elements shall consist of vertical flues, constructed of cast iron, steel, or other suitable metal, of thickness approved by the American Gas Association. The heaters shall be so designed that the products of combustion will pass up through the flues to the vent outlet. Each unit heater shall be provided with adjustable discharge louvers. The unit-heater casings shall be constructed of sheet metal with a heavy angle-iron frame. The control for each unit shall consist of an automatic safety gas valve, and a safety control pilot with thermostatic cutout. One-room thermostat shall be provided for the facility and will control all units simultaneously. The thermostat shall be fitted with a thermometer, and shall operate on not more than a 3°F differential over a temperature range of approximately 35° to 60°F. The thermostat shall operate both the gas valve and the fan motor, closing the valve and stopping the fan on a rise above the desired room temperature, and opening the valve and starting the fan on a drop below the desired temperature. The fan motor may operate either simultaneously with the gas valve, or may be provided with a delayed-action switch which will cause the fan to start or stop slightly later than the opening or closing of the respective gas valve. In the event the pilot light becomes extinguished, the valve in the gas line supplying the burner shall be shut off automatically and shall remain closed until pilot is manually relighted. The gas valve shall render satisfactory service with a 10% voltage fluctuation. In the event the electric power fails or the fan stops, the gas valve shall automatically shut off the supply of gas to the heater and shall resume operation when the power is again available. The fan motors shall operate at a speed not in excess of 1,550 revolutions per minute for units with output capacities up to and including 60,000 BTU per hour and not in excess of 1,200 revolutions per minute for units with capacities above 60,000 BTU per hour. The motors shall be suitable for operation on the 120V electric service and shall be of suitable size to operate the fan unit at its required capacity. A wall mounted manual starter with thermal overload will be provided for each unit by others. Where the units are supplied with heavier-than-air gas such as propane, the

thermostatic pilot shall provide 100% shutoff in case of pilot-flame failure. The fan shafts shall be either directly connected to the driving motor, or indirectly connected by means of an approved multiple V-belt drive. All fans in any one unit shall be of the same size. A back-draft diverter of a type conforming to the standards of the American Gas Association shall be installed in the smoke flue. The noise level of each unit heater shall be appropriate for the space in which the heater is installed. Upon completion of the installation, unit heaters considered by the Contracting Officer to be objectionably noisy shall be replaced with acceptable heaters at no additional cost to the Government.

8. VENT PIPING necessary for the vented gas-fired space-heating appliances shall be installed where shown on the drawings and in accordance with the recommendations of the National Fire Protection Association. The vent pipe shall be Type B conforming to the requirements of the Underwriters' Laboratories, Inc., Gas and Oil Equipment Directory. The vent pipes shall extend through the roof, and shall terminate in conformance with NFPA Standard No. 54. Vents passing through the roof shall be provided with the necessary flashings to obtain waterproof installations.

9. INSTALLATION. Installation of the gas piping system shall be from the connection to each gas utilization device to the point of delivery within 5 feet of the building. The point of delivery is the outlet of the service regulator. Installation of the gas piping system and appliances shall conform to ANSI Z223.1. A 3/8-inch tapped fitting equipped with a plug shall be provided on the downstream side of the regulator for installation of a pressure gage for use when adjusting the regulator. Gas piping shall be installed parallel with lines of the building. Pipe shall be cut accurately and shall be worked into place without springing or forcing.

9.1 THREADED JOINTS shall have tapered threads evenly cut and shall be made with graphite and oil, approved graphite compound or with polytetrafluoroethylene tape, applied to the male threads only. After cutting and before threading, pipe shall be reamed and shall have burs removed. Calking of threaded joints to stop or prevent leaks will not be permitted.

9.2 FINAL CONNECTIONS TO EQUIPMENT shall be made using rigid pipe and fittings.

10. PIPE SUPPORTS. Hangers to support piping shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed as indicated, to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain.

10.1 PIPE HANGERS, AND SUPPORTS shall conform to MSS SP-58 and SP-69. Beam clamps shall be Type 20, 21, 28, or 29.

10.2 HORIZONTAL PIPING. The maximum spacing between pipe supports for straight runs shall comply with MSS SP-69. Pipe hangers or supports shall be spaced not over 5 feet apart at heavy fittings and valves.

10.2.1 Piping Supported From Above. A hanger shall be installed not over 1 foot from each change in direction of piping. Suspended piping hangers shall be Types 1, 6, 7, 9, 10 or 11. Roller supports may be used as specified in MSS SP-58 and SP-69. Type 13 or 15 turnbuckles shall be used where required for vertical adjustment of the piping. Vector forces on hanger rod from vertical angle deflection shall not exceed that allowed by MSS SP-58. Brackets for support of piping at wall shall be Type 34 unless otherwise shown.

Table I
Maximum Spacing Between Pipe Supports

<u>Nominal Pipe Size</u> <u>(inches)</u>	<u>Maximum Span</u> <u>(feet)</u>
1/2 - 1	7

11. PAINTING AND FINISHING

11.1 FACTORY COATING. Equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish.

11.2 FIELD PAINTING. Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory, are specified in SECTION: PAINTING, GENERAL.

12. INSTALLATION OF EQUIPMENT. Equipment shall be installed in accordance with the recommendations of the American Gas Association and the manufacturer of the equipment, and to the satisfaction of the Contracting Officer.

13. OPERATION AND MAINTENANCE INSTRUCTIONS. Printed instructions covering the operation and maintenance of each item of equipment shall be posted at locations determined by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided by the

Contractor for a period of not less than 1 day to instruct representatives of the Government in the operation and maintenance of the heating equipment.

14. TESTS. Upon completion, and prior to acceptance of the installation, the heating system shall be subjected to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than 6 hours, and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities, and labor required to properly conduct tests shall be provided by the Contractor at no additional cost to the Government; and all gas, water, and electricity required will be furnished by the Government.

ZERO ACCIDENTS
SECTION 15D
IDENTIFICATION OF PIPING

INDEX

- | | |
|----------------------------|------------------------|
| 1. Applicable Publications | 3. Bands and Legends |
| 2. General | 4. Identification Tags |

1. APPLICABLE PUBLICATION. The following Federal Standard of the issue listed below but referred to thereafter by basic designation only forms a part of this specification to the extent indicated by the reference thereto:

No. 595a Colors
 & Change
 Notices 1,
 2, 3, 4, 5,
 and 6.

2. GENERAL. All piping in mechanical equipment rooms, except that which is installed in inaccessible locations such as partitions, walls and floors, and that which is buried underground, shall be identified with bands and legends as hereinafter specified. Bands and legends shall be applied to piping at the following locations:

Adjacent to each valve.

Each branch and riser at take-off.

At each pipe passage through wall or floor.

At no more than 40 feet spacing on straight pipe runs.

At each change in direction.

Where pipes are too small for application of bands and legends, identification tags, as hereinafter specified, shall be used.

3. BANDS AND LEGENDS. Bands and legends shall be painted on the pipe or pipe covering or may be pressure sensitive tape pipe markers at the option of the Contractor. Band and legend dimensions for the various pipe sizes shall be in accordance with Table I. Legends and colors of band and legend letters shall be in accordance with Table II. Upper case letters and arabic numerals shall be used for the legends. The maximum system supply pressures and temperatures shall be inserted in the legends where indicated. Legends shall be placed so as to be easily read from operating positions. Arrows shall

be provided adjacent to legends to indicate the direction of flow of materials under normal operating conditions.

3.1 COLORS. The colors referred to in Table II shall match the color chips in Federal Standard 595a, as identified by number in the color schedule below. If the base paints do not match the color chips, they shall be mixed with the proper colors in oil to obtain matching required. All color matching shall be subject to approval.

COLOR SCHEDULE

<u>Color</u>	<u>Number</u> <u>Fed. Std. 595</u>
Red	11105
Yellow	13655
Black	17038
White	17875
Green	14260

3.2 PAINTED BANDS AND LEGENDS. Band painting shall be a minimum of two coats of paint, the prime coat of which may be the general painting specified under SECTION: PAINTING, GENERAL. Where piping is not required to receive general painting, a band prime coat followed by a finish coat shall be applied under this section. Piping which has been coated with asphalt varnish shall have the coat removed with solvents, or other means, for the extent of the required band dimensions. Legends and arrows shall be applied over bands with one or two coats of finish paint as required to obtain complete hiding. All prime and finish paint materials shall conform to applicable requirements of SECTION: PAINTING, GENERAL, except that colors of finish paints shall be as specified under this section.

3.3 PIPE MARKERS of pressure sensitive tape material designed for permanent adhesion to covered and uncovered pipe surfaces may be furnished in lieu of the painted bands and legends hereinbefore specified. Sizes, colors, and legends for tape markers shall be the same as specified for painted bands and legends. Any cleaning or precovering materials that may be necessary to insure permanent adhesion of markers to piping shall be provided. Pipe markers shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate markers that have been satisfactorily used for at least 2 years in comparable installations.

4. IDENTIFICATION TAGS. Where pipes are too small for application of bands and legends, brass identification tags shall be securely fastened at the specified locations. Tags shall be not less than 1-1/2-inch in diameter with depressed black figures 1/2-inch high.

TABLE I

<u>Outside Diameter of Pipe or Pipe Covering</u>	<u>Minimum Width of Color Band</u>	<u>Size and Legend Letters and Numerals</u>
3/4" to 1-1/4"	8"	1/2"
1-1/2" to 2"	8"	3/4"
2-1/2" to 6"	12"	1-1/4"

TABLE II

<u>Material</u>	<u>Band</u>	<u>Color</u>	<u>Letters</u>	<u>Legend</u>
Compressed Air	Green		Black	COMP. AIR 80#
Gas				
Propane	Yellow		Black	PROPANE
Water				
Cold (Potable)	Green		Black	POT. C.W.
Raw to 130°F	Green		Black	INFLUENT
(Influent)				
Treated Water	Green		Black	EFFLUENT
(Effluent)				
Sanitary Sewer	None		Green	S.S.